american journal of agricultural economics

WORKSHOP ON THE IMPROVEMENT OF EDUCATION IN AGRICULTURAL ECONOMICS

BY DEFINING GOALS, DEVELOPING CURRICULA, AND IMPROVING INSTRUCTION

University of Florida
August 23–25, 1972

Volume 55 Number 4
Part II
November 1973

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The principal activities of the association include the following:

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- planning and conducting meetings of the membership in August and December;
- sponsoring annual awards for the outstanding article published in the JOURNAL, for the three best doctoral theses and the three best masters theses in the field of agricultural economics, for three outstanding reports of research in the field, for distinguished teaching in the field, and for outstanding extension programs;
- stimulating interest in agricultural economics among undergraduate students;
- publishing periodically a biographical directory of the association's membership;
- recognizing outstanding agricultural economists through an honorary Fellows program.

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Membership in the association is open to persons having a professional interest in agricultural economics. Dues are payable at the beginning of each calendar year. The rates are as follows:

· Regular membership	$15.00
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THE AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS is published five times a year (February, May, August, November, December) by the American Agricultural Economics Association. Prior to 1968, this JOURNAL was the JOURNAL OF FARM ECONOMICS.

Printed for the AAEA by the George Banta Company, Inc., Menasha, Wisconsin, USA.
Second class postage paid at Lexington, Kentucky, and additional mailing offices.

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american
journal of
agricultural
economics

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Foreword

THESE proceedings contain the major papers and summaries of roundtable discussions from a workshop on education held at the University of Florida at Gainesville, August 23–25, 1972. The workshop was sponsored by the American Agricultural Economics Association.

The general objective of the workshop was to improve education in agricultural economics, with emphasis on undergraduate education. Because of the importance of curriculum in the educational process, curriculum development was selected as the central theme of the workshop. Other topics covered were goals of higher education, the market for agricultural economists, improvement of instruction, and evaluation and rewarding of good teaching performance. Four roundtable discussions gave participants an opportunity to consider educational needs of students preparing for careers in business, extension and other public service, research, and teaching.

Speakers and resource persons were drawn from a wide distribution within the profession and from outside agricultural economics. Participation in the workshop was by invitation. Participation was invited from Land-Grant and non-Land-Grant colleges and universities offering degrees in agricultural economics, from business and industry, and from the USDA and other agencies of federal government.

This was the third workshop on education sponsored by the AAEA during the past decade. The first was at Bemidji, Minnesota, in 1963 and the second at Virginia Polytechnic Institute in 1966. The 1972 workshop was planned and conducted by the entire AAEA Education Committee with detailed planning carried out by a subcommittee consisting of John Helmberger, Chairman, A. C. Hoffman, and Lester V. Manderscheid.

JAMES NIELSON
Committee Chairman

Reorientation of the University*

C. E. Bishop

The university has a vastly more important role in the contemporary society than it did in earlier times. And its significance likely will become even greater in the future.

The university as we know it began to emerge in the eleventh and twelfth centuries when the faculties of medicine and law at Salerno and Bologna started their research [1, p. 70]. In the monastic and episcopal schools of the thirteenth century, the faculties of law, medicine, and theology were joined by faculties teaching the arts. The university developed as an institution to record and preserve the culture while at the same time cultivating an attitude that fostered inquiry and critical examination of ideas. It has continued to preserve the good of the past but has always found it necessary to avoid the tendency toward traditionalism, elitism, and status quo anti-intellectualism.

The university has achieved strength by balancing its dual role of preservation and innovation. Today the view that teaching and research are mutually reinforcing is widely held throughout the university. It is generally conceded that research replenishes the intellectual strength of the university, that it gives substance to teaching. On the other hand, it is generally accepted that the spirit of criticism fostered by good teaching stimulates research. The discovery and transmission of knowledge are regarded as dual, but inseparable, functions of a university, especially in the land grant universities. This conception of the university was reinforced by the realization that the generation and transmission of knowledge involved substantial private and social benefits and costs.

During the period 1943–1968 the American public was particularly enamored of the benefits of higher education. At the end of World War II the public expressed its confidence in education through the enactment of the G. I. Bill of Rights, making education a "right" for millions of veterans. Subsequently, the public made massive investments in higher education facilities and programs in the hope of improving the well-being of the nation. As confidence in scientists rose, public investment in research mounted on an unprecedented scale, and the nation sought to attain such diverse objectives as conquering space, exploring the moon, developing the underdeveloped nations, and abolishing disease and poverty.

In striving to achieve these objectives, society became more and more dependent upon knowledge, and higher education became more and more closely allied with government. This was inevitable since universities produce much of the knowledge upon which contemporary society is based, and graduates of universities provide the specialized competences needed for the functioning of an economy that is increasingly specialized. In fact, the specialization that has taken place in the economy has been mirrored in the universities.

Specialization enhances resource productivity in the universities and in the service-producing industries as well as in goods-producing industries. In the universities, specialization enhances both the generation and transmission of knowledge. It is an essential aspect of the knowledge-generating process, and it has characterized the organization and function of universities since their inception. Specialization within the university has proceeded rapidly, especially during the last 20 years. It is reflected in the proliferation of departments and degree programs. It also is clearly evident in the research programs of universities.

Let me emphasize, however, that although it is organized around and produces many specialists, the university is not a specializing institution. The concept of a university implies that it is a generalizing institution, emphasizing the integration of knowledge. The specialized disciplines are integral parts of an interdisciplinary whole. The mission of the university to teach people to think is infinitely more important than its efforts to teach people what to think about.

Individual research tends to be inward looking. Most research professors concentrate on a small spectrum of their field of specialization. Moreover, this spectrum generally narrows as the

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[*] In preparation of this paper I have benefited greatly from the comments of students, faculty, and staff engaged in the academic reorganization of the College Park Campus of the University of Maryland. I acknowledge especially the assistance of Drs. George H. Callcott and Thomas B. Day.

C. E. Bishop *is Chancellor of the University of Maryland.*

professor becomes established within his field. Emphasis upon research and desire for professional esteem in a technological society provide strong incentives for specialization of function, specialized professional language, and an inward orientation of professors. The peer system of governance that is characteristic of most universities strengthens faculty orientation toward their specialty and their academic departments rather than toward the university. In addition to increased emphasis upon research, professionalization of the universities has resulted in highly specialized degree programs, increased requirements for degrees, and numerous course prerequisites.

During the past 25 years, American universities have traveled far down this road. As more areas of professional competence were recognized, universities were called upon to render assistance in the solution of more important social problems. The institutions of higher education in this country have become major shapers of society. It is generally conceded that the educational system of a nation has its roots in the culture of the nation. However, the American experience demonstrates clearly that education enters into the creation and renewal as well as the preservation of the culture of a nation. There is a mutual interdependence between education, culture, and the structure of society. In the fulfillment of this expanded role, it has become necessary for universities to accept the responsibility for identifying and exploring intellectually the major issues that confront the nation.

According to traditional standards, the changes that have been made in American universities have enhanced their productivity. Certainly the number of graduates at all degree levels has exceeded all expectations. In like manner, the research output of universities has increased sharply. But these changes have not always been accomplished in the most efficient way from the standpoint of the university, and it is clear that the social costs have not been given due consideration.

Much of the knowledge base that provided greatly increased production possibilities was derived from social investment in research in the colleges and universities. Certainly much of the technological development that made possible increased supplies of food came from the research of the land-grant universities. There is little question, however, that we have been overly imbued by technological research. The same research that yielded increased production of crops and livestock also accelerated the depopulation of rural areas and the growth of central city ghettos. The technology that made possible rapid transportation also yielded polluted air. In these and in other instances, as technological research was introduced, highly important side effects emerged that were not planned. Neither the individuals concerned nor the society sought them. They were not anticipated because our approachs to developing and integrating knowledge into society were too specialized.

In a very restricted framework of analysis and decision making with respect to new technology, we failed to recognize that production technology, the structure of industry, the pattern of growth of employment, income distribution, and the location of population are very much interrelated. Many of the most significant changes in the economic and social structure that emerged as a result of the adoption of new technology were made in an attempt to adjust to the new technology, and they do not represent changes that were planned. It was erroneously assumed that the development of technology to enhance the supply of products would automatically enhance national well-being. This did not follow. Serious problems of national consequence emerged that were largely external to the specialized systems of research and decision making that led to the development and introduction of the new technology.

Increased concern over problems of urban and rural development, resource utilization and conservation, environmental quality, and the quality of life generally can be traced to social costs of technological development. At some point it is clear that serious consideration must be given to the kind of society desired and then more emphasis placed upon research designed to determine whether reasonably efficient production technology can be developed that is consistent with that organization of society. This, of course, is another way of saying that more consideration must be given to the social (costs) effects of technological change.

Agencies that have been supplying much of the support for research are beginning to ask penetrating questions with respect to the social value of research. There is no evidence of diminishing returns to investments in the generation of knowledge. However, there is growing concern that the knowledge generated must be helpful in solving important problems and that the social benefits from additional investments in research exceed the benefits from alternative investments. Recently, even such prestigious organizations as the National Science Foundation have been emphasizing the development of research programs promising larger social benefits.

Universities must show more concern over the effects of their research. Clearly, the universities are accountable to society for the knowledge that they generate. The responsibility for the use of knowledge is not completely separate and distinct from the responsibility for its generation. Although research productivity is enhanced through specialized and partial investigations, institutions that sponsor research must accept responsibility for considering the social and private costs as well as the benefits derived from the knowledge that is generated.

Universities cannot deny public access to knowledge that is generated from the expenditure of public funds. Land grant universities, in particular, have a specific commitment to make public the results of their research. Some control can be exerted in the choice of projects undertaken. This may be feasible in mission-oriented or technological research. It may prove to be impossible in the more abstract kinds of research. In any event, special precautions are necessary to assure that research programs do not leave important effects unrecognized. Such safeguards will inevitably mean that research proposals and results should be scrutinized from an interdisciplinary perspective. Technologically oriented research, for example, should be viewed from the perspective of philosophers, sociologists, economists, and others who are concerned over the organization and structure of society as well as by the biologists and engineers. Even though the output of particular research projects is unknown, more attention must be given to weighing the likely effects of the knowledge that is generated once it is known. An interdisciplinary perspective may be necessary to assess these effects adequately.

Although many of the goals pursued by this nation over the last decade have proven to be more elusive than anticipated, and the public is less enamored of research than it was, the public has high expectations that the universities will continue to have a significant impact upon the future of this country. During the last decade the public probably has been led to expect too much from university research. Expectations have been developed that cannot be fulfilled. In order to avoid such misconceptions, the role of the university as a social institution must be clarified.

As a center of learning, the university is dedicated to the search for truth and to making knowledge accessible to people. Its mission is to develop the intellect of people and only indirectly to develop the society. The value of a university rests in the fact that it produces ideas, often divergent and conflicting ideas. It is a place where the merit of an idea is tested by bringing it into conflict with other ideas. By its nature, the university seeks to impart a questioning and challenging attitude. In such an institution, tolerance is much more appropriate than advocacy. The university, therefore, is by its nature better equipped to serve as a social critic than as a guide to social progress.

Even so, universities cannot afford to assume a passive attitude toward their research programs. It has been amply demonstrated that the knowledge-generating programs of the universities are not neutral in their effects. The universities must therefore assume a critical attitude toward their research activities, accounting fully for the social costs as well as the social benefits of research. This will become increasingly necessary for continued public support of university research. More comprehensive university accountability inevitably will entail a reduction in the semi-autonomous character of academic departments.

At the same time that the research programs of universities are being brought under closer scrutiny, demands are growing that programs of instruction be changed. Universities are serving a different clientele and under different conditions than existed a generation earlier.

A high percentage of the youth now enroll in colleges and universities. The large state universities have huge cosmopolitan student populations. Many students desire to pursue traditional patterns and specialized courses of study. It is the responsibility of the professional schools and colleges to give consideration to the qualifications desired of their graduates and to provide opportunities to acquire the expertise necessary to meet these demands. There is a danger, however, from over-specialization in an advanced technological society. It is exceedingly difficult to maintain a reasonable matching of the supply and demand of highly specialized skills in an economy characterized by frequent technological changes and large shifts in demand for professional skills. Under these conditions, no projection is likely to be perfect or of long duration. It is especially important that universities be on guard to assure that their responsibilities as educational institutions are not undermined by overemphasis upon the training of students for particular occupations. Rather, the challenge is to produce "adaptable specialists" and to provide them with ample opportunities for continuing education.

There is an increasing number of students, on the other hand, who object to a professional orientation in their education. They rebel at being "made over into the image of their professors." They argue, rightfully in my judgment, that the *raison d'etre* of the university is and must be more than training, that it is education *per se.*

Students are very much concerned over problems that transcend the major specialized curricula that have been developed. Their concern is a natural reaction to the treatment of problems in the narrow partial framework required by a high degree of specialization. They are also concerned that excessive specialization denies them access to knowledge that they seek.

A major dynamic of the revolution in higher education is the demand by students that they be given access to the knowledge that they seek to acquire without extreme specialization. In the pursuit of this objective, students will provide much of the drive needed in penetrating the highly specialized systems that have developed within the universities. Demands are emanating from all campuses for multidisciplinary and interdisciplinary programs. Such programs are not unique but are structured at a higher level of generality than has prevailed in major universities in recent years.

No group has more interest than students in the problems of illiteracy, poverty, poor health, underdevelopment of human resources, deterioration of natural resources, and other problems associated with technological development and economic growth. They are demanding that universities broaden curricula to provide educational opportunities consonant with the complex problems of a contemporary society. Specifically, students seem to be asking that a new genre of broadly based programs be devised, encompassing "pure" and "empirical" elements of knowledge that provide for professional competence and adaptability.

In the most extreme form, students demand freedom to select subject matter in accordance with their own desires. They seek virtually complete (consumer) sovereignty over what they learn. Clearly, these demands imply a vastly different role for the university than that traditionally followed, reducing the university to the role of providing access to knowledge. The implications for the traditional academic departments are obvious.

As more general degrees that encompass subject matter spanning several departments are developed, faculty members will recognize the necessity for simultaneously protecting departmental interests while these interests are imbedded in a larger knowledge matrix. The interdepartmental association that is involved in the development of such degree programs will force faculty to think broadly in order to protect their professional domain. In the process, let us hope that we will gain a better appreciation of the interdependency of knowledge and generate open-minded and adventurous attitudes toward scholarly endeavors.

Greater flexibility in methods of acquiring access to knowledge is essential. Students are demanding and they will be allowed to proceed at a pace consistent with their own capabilities. In the future, greater emphasis will be placed upon the attainment of knowledge *per se,* and less attention will be given to the accumulation of academic credits, the time spent in residence in institutions of higher education, or how the knowledge is acquired.

Much of the discussion that has taken place recently relative to three-year or four-year degrees is misplaced. Hopefully, such discussions will force the universities to rethink the meaning of degrees. Certainly, no one would contend that degrees should be awarded on the basis of time spent in residence at a university. This measure of inputs is of little, if any, significance. Instead, degrees should be conferred on the basis of knowledge attained, a reasonable measure of output. In this connection, a major challenge facing universities is the development of performance-based criteria of attainment of knowledge in which there is sufficient confidence to use them as a basis for awarding degrees.

The revolution in higher education extends far beyond the traditional departments and campuses. Taxpayers of all walks of life are demanding that access to knowledge be provided to a much broader audience. The university is being asked to facilitate access through the development of new and lower cost systems. The challenge is to make knowledge accessible, not to store it in libraries. The costs of interrupting or postponing a career in order to established extended periods of residence at an institution of higher education are prohibitive for many who desire and can fulfill the academic requirements for degrees. Universities face a challenge in providing accessibility that is convenient and relatively inexpensive to those seeking access. When acceptable performance-based criteria have been developed, it will be recognized that the means of acquiring knowledge are of little, if any, relevance to the granting of degrees. Recognition of this fact will enable universities to explore the benefits to be derived from modern methods of communication, emphasizing the cost effectiveness of alternative means of providing access to knowledge.

In summary, the university is under greater stress than it has been for many years. In an effort to enhance its productivity in the search for knowledge, the university has developed highly specialized structures. The increased productivity of its research has increased the social significance of the university and has drawn it more closely to government, bringing increased demands for social significance in research and improved accountability for the use of research funds. Increased demands for higher education have been accompanied by burgeoning enrollments in the universities and demands for more flexible degree programs and improved access to knowledge. All of these changes have merit. They must be considered carefully by the universities. Taken together, they will alter significantly the structure and functions of the university.

Reference

[1] McKeon, Richard, "Where We Are and Where We Are Going," *The University of Chicago Record* 6:70, June 1972.

Higher Education in the Rural Social Sciences*

A. T. Mosher

Our topic is one of those perennials that are always with us. It poses questions that never get settled because the context in which higher education is carried on is constantly shifting and because the rural social sciences are continuously evolving. All anyone can do in opening the discussion is to review some of the important questions that are involved and state some personal preferences as a means of stimulating debate.

Let us begin with a couple of definitions. When we speak of "higher education," I assume that we mean formal schooling beyond high school graduation. Learning needs to be a lifelong activity, but we are confining our attention here to those aspects of it that most need to be emphasized at the age of university students—the late teens and the twenties—and that are most appropriate for treatment in the atmosphere and routines of formal study in the company of professors and other students. Thus, what we mean by higher education is in-school education for persons in their late teens and twenties who have previously completed high school.

But how about "the rural social sciences?" The second term in our topic is not "agricultural economics," and I assume that the phrase "the rural social sciences" was deliberately chosen. Clearly agricultural economics and rural sociology are included, even at a time when many in these professions are questioning whether the adjectives attached to economics and sociology are pertinent or necessary. How about anthropology? Most of the studies of anthropologists have been conducted in rural cultures, and their insights are extremely relevant to many modern as well as older rural problems; they are relevant today in the United States as well as in primitive cultures. How about social psychology and political science? They deal with other broad ranges of phenomena that are important in dealing with rural problems.

As a matter of fact, it may be easier to draw a line between the humanities and the social sciences than to deal with the question of what, within the social sciences, is distinctively rural. Each social science has a set of analytical tools that are "scientific," and to one degree or another each tries to reach generalizations that allow an element of prediction. Moreover, *interactions* among persons within *patterns of organization* are the ground of their investigations. By contrast, the humanities are more interested in persons and in individuality, even though they also may explore the social settings within which the individual's behavior may be better understood.

I shall take it in the remainder of this paper, therefore, that our concern is with the social sciences that are primarily concerned about patterns of human behavior and social interaction, sometimes explicitly but not always in exclusively rural settings.

Another term—not mentioned in our topic—is necessary to our discussion. That term is "social problems." Each discipline concentrates on selected aspects of reality in order to increase understanding of the aspects it studies. Moreover, the real world problems we all face cannot be classified in a manner consistent with the divisions among the social sciences. They cut across those boundaries, and our understanding of any single problem is distorted when a problem is viewed solely from the perspective of any one social science. One of the most fundamental issues with respect to the objective of higher education in the rural social sciences arises precisely at this point: to what extent should it introduce students to the domains of selected academic disciplines, and to what extent should it enable students to grapple effectively with the social problems of the real world?

Ours is not a new topic. Anyone who has been following this *Journal* knows that every year several articles appear that discuss one or another aspect of it. Six years ago a Symposium for Teachers of Agricultural Economics was held at Virginia Polytechnic Institute, and the papers were published in a special number of the *Journal*. Two speakers at that symposium suggested objectives for undergraduate education in agricultural economics that bear repeating here. Acker [1] proposed four objectives:

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* The author wishes to express his indebtedness to John W. Mellor, Wayne A. Schutjer, William H. Sewell, D. Woods Thomas, A. M. Weisblat, and Gilbert F. White who commented helpfully on the preliminary draft of this paper.

A. T. Mosher *is with The Agricultural Development Council, Inc. and was President of the Council when this paper was presented.*

(1) To give students *mobility;*
(2) To increase a student's *learning power;*
(3) To give a subject *dimension* and *perspective;*
(4) To maintain the freshman level of *enthusiasm.*

I find this a useful formulation. From the standpoint of relative importance I would move the first objective to fourth place, although it remains important. The first objective, it seems to me, should be to foster in students a habit of continuous learning, so that they can apply more and more rigorous analysis, and an ever broadening fund of knowledge, to emerging problems—whether within their professions or in their public and private lives. Since that objective is usually pursued through studies that are colored by the points of view of different disciplines, giving each subject "dimension and perspective" is important. Certainly the maintenance and hopefully the intensification of enthusiasm needs to characterize the whole process. And the total program needs to be developed with each student's probable need for future vocational and place mobility clearly in mind.

If this list of objectives seems rather general, it may, by that very token, be a good place for us to begin. That is because the role of the rural social sciences in higher education needs to be discussed separately with respect to four different groups of students. There are, first, the many undergraduate students who will not choose to major in one of the social sciences but who nevertheless need at least an introduction to their insights. There are, second, those students who do major in one or another of the social sciences but for whom the B.S. degree is terminal. In addition, it is necessary to consider the case of students who proceed beyond the B.S. degree to major at the graduate level in a social science. Finally, there are students who proceed to graduate work majoring outside the social sciences but who need to develop a groundwork for interdisciplinary collaboration with social scientists, just as social scientists need a preparation that will enable them to collaborate with research workers in other fields.

Obviously one cannot, in the time at our disposal, analyze in depth the problem with respect to the needs of any one of these four groups of students, let alone all of them. But unless we do make the distinction among the four groups, we are likely to speak at cross-purposes in the discussion to follow.

Let us begin, then, with the case of the undergraduate student who may or may not plan later to specialize in one of the social sciences. What should all students get of the social sciences, regardless of the direction in which they may specialize? I assume we would all agree with James [3, p. 283], who said in the same VPI symposium: "Any student graduating from a good university should have a broad university education regardless of his major." And I would assume that the purpose of a broad university education is to help students progress into mature adulthood and citizenship aided by what human experience to date has to offer.

To say "what human experience *to date* has to offer" suggests an orientation to the past. Surely, however, a good university education should be oriented primarily to that future during which students will live out their lives. Part of that preparation for the future is to place a much greater emphasis on developing problem-solving ability than on passing on accumulated knowledge, but only part, for the human race has learned quite a lot that is still useful. The problem is to present and discuss what has been learned in the past that is still useful in a manner such that its relevance to the future is apparent and to do that with as much economy of time and effort as possible. In that review of human experience it is important to range more widely than just western culture. Classicism in education has long emphasized what can be learned from the distant past that is of current value. Today we can and should draw on the additional resources of the more nearly contemporary experiences of people in all parts of the world.

The social sciences have much to contribute to this general education for the future, but I have come to doubt that in courses for all students at the undergraduate level, their contribution can best be made through courses organized by separate social science disciplines. Instead, it seems to me that it would be better to develop a curriculum of integrated social science courses in each of which the insights of various social sciences and, at appropriate points, insights from the humanities and from the physical and biological sciences as well are considered together. The organizing foci of these courses might be a selected set of *concepts*, a set of *processes* of *human interaction* that have been identified and studied in the past and that are likely to persist, and a set of *major social problems*, some of which are new but some of which, old as the hills, are still troublesome.

While the organization of such courses could be accomplished in various ways, it would seem to me that the set of social problems might well be the major basis for organization, with the discussion of relevant concepts and processes brought into the discussion at appropriate points. However, since increasing understanding of concepts and processes is most important from the standpoint of helping students improve their capacity to think and to continue learning, the three sets are discussed in reverse order in this paper.

As illustration only, let me indicate the type of content that might go into such a set of courses.

Concepts

With respect to concepts—the ideas or generalities in terms of which thinking is carried on—I would place that of *systems* high on the list. The *farm business* and the *neighborhood* are basic rural examples. The *agricultural systems,* of which commercial and noncommercial agri-support services and the whole agri-milieu of policies and institutions within which agriculture must be carried on are component parts, is extremely important although not wholly rural. The *social system* ought to be treated as another example, as should the concept of *culture*. The *national economic* system, on a more restricted scale the system of *financial institutions,* and local and national *political systems* are still other important examples of systems to be discussed. In all of these discussions of systems considerable attention should be paid to the concept of "feedback," of the continuous modification of related systems by each change in any one of them, whether economic, social, political, or technological. Almost more than anything else, students need to learn that component parts of systems cannot be changed without widespread repercussions.

A second organizing concept on which I would suggest placing major emphasis is that of the *optimum*. It is here that a central, if not *the* central concern of much of economics can be introduced, and where the closely related problems of seeking a balance between the needs of the individual and of society, between the functions of local and national government, and even between bilateral and multilateral negotiations of international affairs can be explored. Too frequently these paired considerations are seen as conflicting absolutes rather than as coordinate necessities between or among which optimum solutions must be sought.

A third concept to which I would give high priority is the *probabilistic nature* of much of our *knowledge*. It is particularly important throughout the social sciences in view of the intimate interaction of multiple causative factors, and particularly because of the personal differences among human beings. Our knowledge about human behavior and interactions is fundamentally different from our knowledge about the inanimate world, and recognition of that difference is basic to mature decision-making in the economic, social, and political spheres. The concept of statistically probabilistic knowledge, like those of systems and the optimum, can be illustrated from many fields.

This list of organizing concepts could be expanded considerably. To take a few examples from economics that have parallels in other social science fields, it might include a consideration of the multiform application of the concept of externalities, the concepts of diminishing returns and diminishing utility, economies and diseconomies of scale, and the important but diminishing applicability of the concept of "free goods."

Processes

As for the set of processes to be discussed, various types of *social change* should certainly be one. These include, but are not limited to, increasing urbanization, organizational bureaucratization, the emergence and decline of various kinds of elite groups, the integration of diverse ethnic or cultural subcultures, socialization of the young, and the economic and political concomitants of these and similar changes.

Another important process is that of *group decision-making*. Prominent examples for exploration are group decision-making through the market and price mechanisms, through legislative planning, through legal regulations, through patterns of corporate management, and through the crystallization and modification of cultural norms, values, customs, and mores. Widely different in form and method, customarily discussed separately within individual social science disciplines, all these methods of social decision-making have much in common. And when relevant techniques for social action are being sought, these are among the mechanisms that are available for employment.

Innovation is another process of great importance. *Technological innovations* are usually modified only slightly during the process of dissemination and adoption. But is the same true of *social and political innovations?* Or are these usually altered quite drastically during the process of adoption so that what finally comes to prevail is quite different from the innovative idea or proposal that launched the process?

The above are only four examples of the many processes of human interaction that the social sciences explore and that all students need to understand, certainly as citizens whether within their vocations or not.

Social Problems

The third set of foci for organizing integrated social science courses might consist of selected major social problems. One of these is the interacting problem of *population growth, resources,* and *technology*. The whole present day ecological concern is part of this as is the concern about economic growth and the meaning of development. Insights with respect to it run all through the social sciences, and knowledge from the physical and biological sciences must be brought in, too.

A second current problem of high priority is that of *income distribution* in both developed and developing societies. Part of this problem is economic, insofar as income is related to work for which payment is made. Part of it is political insofar as transfer payments and public services are involved. Some of the repercussions of whatever is done are economic; some are social; some are political.

A third current problem that could well serve as a focus for study is that of *economic and social discrimination.* What do we know about it? What are its apparent causes? What are its repercussions? What can be done about it?

A fourth could be the problem of the relationship between *messages and truth.* Not much attention is paid nowadays to Plato's parable of *The Cave,* but it is still as pertinent and revealing as it was when he conceived it. Our present situation is even more precarious. Added to the partialities of our messages that flow from inherent human limitations of understanding and faulty transmission mechanisms, there are added the distortions unconsciously and even intentionally introduced into advertising, some governmental reports, and some academic teaching through conscious selection of materials to be emphasized, criticized or avoided, even as in this paper. We live by messages when what we need is the *truth;* and the truth is everlastingly evasive.

The fifth basic problem to which the social sciences can make a major contribution and that could serve as a primary focus of study is the perennial interaction and conflict between individual *freedom,* on the one hand, and *social cohesion and order,* on the other. Johnson in "The Quest for Relevance in Agricultural Economics," reminded us that "the history of human societies is one of balancing the interest of groups against those of individuals. And current problems and issues are no exception" [4, p. 734].

Even when one is concerned solely about cohesion and order within society, human freedom is still important. Consider the term "deviant." It has come to have an almost pejorative meaning as the person or event that does not conform to a generality or generalization (and generalizations are at the heart of the social sciences). Yet, as my colleague A. M. Weisblat continuously reminds us, it is the deviant person or event that may be the most significant from the standpoint of social, economic, and political change. That is where innovations and innovators are to be found. Consequently, the individual cases at the thin ends of a statistical distribution should frequently receive our major attention, rather than the strength of central tendency.

Other important current problems that could serve as integrating foci in undergraduate teaching of the social sciences will suggest themselves to you, but the one I wish to make my final suggestion—even though to do so means enlisting the participation of the humanities as well as the social sciences—is the problem of human tragedy: tragedy not in the colloquial sense of catastrophic accident or physical disaster but in the classical sense of having to betray one deeply cherished value in the process of being true to another. It is a much bigger problem than the economic concepts of trade-offs and opportunity costs although those are minor forms of it and certainly should be introduced and discussed. They are not really so minor when one considers the human consequences of actions foregone in order to undertake others. Tragedy has its social counterparts where actions taken in pursuit of social cohesion place crippling burdens on the freedoms of individuals. Its most poignant expression, however, is in the personal tragedies in which to do the right thing with respect to one loved person or group inevitably means to do the wrong thing with respect to another. We do this all of the time. We have to do it, not because of some inner and devilish compulsion or because we make the wrong choice, but because the basic nature of human life and society is such that we cannot avoid it.

What I have been suggesting is that one of the important tasks of the social sciences at the undergraduate level of higher education is to participate in the education of all students in the direction of developing into mature persons and citizens. That education needs to be future oriented in the sense that it brings the past fruits and present analytical methods of the social sciences to bear on processes and problems that are critically important today. Students are quite right when they demand more relevance in their courses. They are right when they object to undergraduate courses that seem more oriented to building up the interests and empires of particular disciplines than to throwing useful light on current problems.

Meanwhile, we as teachers and as representatives of a social science discipline need some reorientation also. Even those who favor trying to move toward a more problem-solving and multidisciplinary approach in teaching recognize that a major difficulty is that each discipline, to use Mellor's [6] words, "has a good deal of logic of its own. Disciplines are essentially organized around relatively fully integrated bodies of theory and research methodology. . . . If one teaches within the discipline . . . there are certain economies of operation. This is not to argue . . . that this is good for [undergraduate] teaching, but simply to indicate that there are powerful rational forces pressing in this direction." There are indeed! For one thing, it is embarrassing to admit how limited a contribution many of our tools and insights can make to the solution of practical human problems. Is it not part of the problem that we have assumed a sophistication and a near-finality of our knowledge that it does not in fact possess? It is not easy to admit—what I believe to be the fact—that we are living in some intermediate stage of what is still a relatively primitive culture. We are nowhere near understanding ourselves, society, and the world. Perhaps we never shall be. But is it not better to admit our situation? Would this not contribute to meeting one of Acker's objectives, namely, to maintain and hopefully to increase students' enthusiasm? Might not students, through some such curriculum as I have suggested, come to see that the social sciences do have a considerable number of useful insights about highly relevant current problems? They would also discover how partial our answers are and how much remains for them to do. After all, what stimulates good students is not the beauty of ready-made answers but the enthusiasm of good teachers in the presence of the unknown.

Moving now to the second role of the social sciences at the undergraduate level, we turn to the group of students who choose to specialize in one of the social sciences. There are two subsets within this group, each with somewhat different needs. One subset includes those students who expect that the B.S. degree will be terminal for them and who plan immediately after graduation to seek employment related to agriculture or rural life. The other subset consists of those who plan to go to graduate school. What is to be avoided is designing a common undergraduate curriculum for both subsets, with the preparatory needs of graduate students primarily in mind. Even today only a minority of undergraduates go on to graduate school. The needs of that minority should not dominate the nature of the courses available to the majority for whom the B.S. degree is terminal.

It was with respect to those students who plan to seek employment immediately after receiving the B.S. degree that James [3], again in the VPI symposium six years ago, proposed three objectives: to teach the student to think for himself, taking a logical approach to problem solving and decision making; to achieve a "minimum level of attainment in specific areas of knowledge;" to give each student "enough applied training so that he is able to secure a job and to be successful in his first employment."

It is because the "specific areas of knowledge" that different students will need vary so widely that their needs can only be met by programs of study in which they may choose among many elective courses. For the most part, what they need is a considerable variety of applied courses to give them both broad understanding and reasonable job mobility in the future, combined with a greater concentration on additional applied courses particularly germane to the specific type of job the student would prefer and hopes he can find. It is doubtful that he should be required to take detailed courses concentrating on general theory. Let him take them or not as he feels inclined. And it is important to bear in mind that the emphasis needs to be on the student's probable first post-graduation position, leaving much needed learning to be acquired by each person later, on his own.

The undergraduate needs of those students who plan to proceed directly to graduate school to specialize in one of the social sciences are somewhat different. Such students also need a rather broad spectrum of applied courses but for a different reason. It is not because they plan to seek employment as farm managers, credit officers, marketing officials, or enter any other immediate post-B.S. employment. It is, instead, to give them insight and perspective into the various specific types of problems to which the theory and tools of analysis on which they will largely concentrate as graduate students need to be pertinent and applicable. Along with that wide variety of applied courses such students need a set of solid courses on disciplinary theory, mathematics, and statistics to prepare them specifically for graduate school. Many of the concepts treated more exhaustively in these theory courses would be the same as those introduced in the integrated social science courses for all students, but here they would be more fully developed within the context of a particular discipline.

To recapitulate, it seems to me that *all* undergraduate students interested in careers related in one way or another to agriculture or rural life need from the social sciences an increasing awareness and command of selected insights of these disciplines, the relevance of those insights to contemporary human problems, and an awareness of the interrelationships among the insights of the various social sciences and between them and the fruits of other branches of human knowledge.

In addition, students who assume that the B.S. degree will be terminal for them and who major in a social science at the undergraduate level need a broad spectrum of applied social science courses plus some concentration on courses related to the particular type of employment they intend to seek. In any case, their preparation for employment can only be for the immediate future; professional needs will change rapidly, and only life-long learning can keep up with them.

Students who plan to go to graduate school to major in a social science need a similar broad spectrum of undergraduate applied social science courses as well as selected general courses in other fields of study. In addition they need solid courses in basic theory, mathematics, and statistics to prepare them for the more specialized and largely discipline-oriented studies in graduate school.

One cardinal point to be considered in what should be emphasized in graduate curricula (and from here on I shall confine my comments to agricultural economics) is that although the Ph.D. degree is the end of the line for in-school student experience, it is not the final process in the making of a highly productive social scientist. To realize that, one has only to ask oneself how much of the mature competence of a Brandow, Hathaway, Heady, Johnson, Krishna, Ruttan, or Schultz (to name only a few examples and in alphabetical order) is due to the nature of their formal graduate study—much, but by no means all. Graduate study is itself an intermediate stage, usually traversed between the ages of 22 and 30 Much of the formation of a good agricultural economist comes during the years of junior apprenticeship, peer interaction, and cumulative experience after the Ph.D. is far behind.

With that in mind, there is general agreement that the major emphasis within the years of formal graduate study should be on theory and on developing skill in the use of analytical techniques. Taking that as given, we are left with at least three important problems. One is the scope of agricultural economics. The second is the degree of adequacy of current theory. The third is the question of the degree to which the analytical techniques of agricultural economics taught in graduate school are to be econometric.

Important as these questions are, they do not get settled. Individual answers are innumerable. At certain times, interspersed among period of hot debate, there seems to be a strong majority opinion within the profession with respect to each of them, but there are always vociferous minority reports, to many of which more attention should be paid than is often the case, as witness the recent low esteem of institutional economics. Nor does there seem to me to be a secular trend in the answers in any particular direction except perhaps with respect to the relative importance of econometrics, and that trend is too recent to indicate that it is permanent. What we can conclude is that each of these questions is well worth continuous debate, and I would argue that a strong thread running through graduate programs of study ought to be the recognition that each of these questions is perennial for good reasons. How else can we avoid creating conditioned myopia that what is most recent is best, and perhaps even ultimate?

Definitions of the scope of agricultural economics take many forms. One good one, from my point of view, is that implicit in Bogor's [2] objectives of agricultural economics, quoted by James [5, p. 285] at VPI:

> (a) To understand and describe the environment in which farm products are produced, distributed and consumed, including agriculture's social and political institutions, its

physical and human resources and the relevant value preferences of its people;
(b) To refine and extend the principles of economics as they apply in the production, distribution and consumption of farm products;
(c) To analyze opportunities for fuller attainment of public and private objectives through changes in the use of scarce resources available for production, distribution and consumption of farm products.

The problem, however, is not primarily the multiplicity of formal definitions but instead the *de facto* definitions implicit within any program of graduate studies in the relative emphasis given to various aspects of what is admittedly a field that is difficult to define. These implicit definitions grow partly out of the many specializations to which individual faculty members devote themselves, each still, and usually legitimately, calling himself an agricultural economist. They grow partly out of shifting professional enthusiasms and fashions to concentrate now on this and next on that particular problem or analytical technique within the broad field. They grow partly out of the finiteness of our spans of attention and out of different prevailing forms of thought at any one time. In the past these facets of specialization and tendencies toward concentration have been considered highly productive. They still are, but we also now recognize how broad many of the systems are with which our analyses are concerned, and the corollary of that is the partialities and distortions inherent in any narrow specialization.

Perhaps a better formulation of this problem would be, not how the field of agricultural economics is to be defined, but to what extent students should be encouraged to concentrate exclusively on agricultural economics during their graduate program. One gets the impression that curricular demands, particularly in the fields of statistics and quantitative analysis, have become so great that no matter how much intellectual assent may be given to the virtues of some attention to other disciplines, there simply is no time for students to work noneconomic courses into their programs. My own view is that those universities are on the right track that allow considerable latitude for programs of study to be tailored to the particular interests of individual students, including encouraging many students to take some courses in other fields. These tend to be universities or departments that are pretty confident of their own position among universities or departments; they are not apprehensive that the later performance, or lack of it, by any of their students is going to jeopardize their standing. By contrast, those departments tend to be most rigid in their disciplinary requirements that are consciously trying hard to become "Number 1," but secretly doubt that they have arrived.

But even that latitude is not enough. The need for students to have opportunities to explore specific problems together with students specializing in other disciplines—social, physical, and biological—is not limited to the undergraduate years. I concur with those including Johnson [4], Sewell [9], and White [10] who contend that multidisciplinary exploration of selected problems should be part of the required program of every graduate student in a social science.

The second open question is that of the adequacy of present theory. It seems to me that there is much more widespread acknowledgement of this problem today than there was a decade ago. Growth theory is perhaps the most obvious field in which it is recognized, along with more limited aspects of it such as capital theory which Schultz has been examining so assiduously. Even the theory of the firm is being challenged more and more along the lines suggested by Johnson [5].

Two separate types of exploration seem to me to be fruitful with respect to this problem. One is the thesis pursued by Mitchell [7] 40 years ago: the recognition that the *new* theory developed at any particular time is a response to the burning public issues of the day. That fact he demonstrated from the work of Adam Smith through that of Bentham, Malthus, Ricardo, and Mill, and the same correspondence is to be seen in the much later work of Keynes and present day concern about economic growth. Once developed, theories tend to persist on their own momentum assisted by academic habit. When distinctively new issues come to the fore, previous theories may not correspond to them.

The other approach to this problem is to recognize that, perhaps especially in agricultural economics, a considerable amount of very old theory is still quite relevant today. Diminishing returns to land are still very real over much of the earth's surfaces. What is perhaps most important with respect to theory, in addition to giving it the large part in graduate programs that it deserves, is to try to assure that its *ad hoc* character is thoroughly understood, so that each portion of it is used where it is relevant and not where it is not.

The third big question has to do with the degree to which agricultural economics becomes synonymous with econometrics plus mathematical economics. What is at issue here is not the effort to press for and increase the precision of quantitative measurement wherever that is possible, or the utility of employing mathematical logic whenever it can appropriately be used. Instead, the question is whether all problems that do not lend themselves to such treatment are to be pushed out of the domain of respectable economics. I doubt that any of us would contend that there is not a tendency in that direction today.

This tendency is of debatable value. In a report of a recent conference on computer technology [8] is found this passage: "Several participants . . . observed that while the computer might have forced . . . older scholars to construe their problems in new ways, the impact on younger persons who had grown up with the computer had been different. 'Some of these younger fellows know Fortran . . . better than English,'" said one of the participants. And because econometrics, mathematical economics, and computer facilities are available, much work utilizing them today is based on assumptions and estimates of variables that make their results of dubious utility and frequently misleading. Competent, mature scholars know this and make allowances for it, but do most of their students?

If this tendency to limit agricultural economics, in effect, to studies that can legitimately be treated econometrically continues to run its course, what then? We already are confronted by a situation in which the domains of the different disciplines are not mutually exclusive nor do they, among them, cover the whole spectrum of human, social, and economic phenomena needing attention. Many important areas needing study now fall between the slats of established disciplines. Many problems to which the most pertinent concepts and principles are economic (in the older sense) cannot yet be tackled quantitatively. If we now push out of economics all that cannot currently be analyzed mathematically, and at the same time many scientists in other social science disciplines are trying to do likewise, who will pay attention to the variables and the multiform feedbacks that cannot be handled in that manner?

How can a department of agricultural economics move toward dealing with these perennial problems constructively? Let me conclude by bringing together six suggestions, none of them new and none of them originating with me:

(1) Assemble a staff of persons with varying viewpoints with respect to all three of these questions.
(2) Pick smart students.
(3) Since so much of graduate learning consists of what students learn from each other, give *all* of them desks in rooms accommodating three to six students each.
(4) Establish a program of frequent staff-student seminars in which students can hear faculty members debating their differences and in which students can participate as peers.
(5) Adopt a set of regulations that allows students to undertake different programs of courses tailored to their special interests, with the option to include selected individual courses from other departments.
(6) Let some of the research and/or seminar experience of each graduate student be in "multidisciplinary, problem-solving study and efforts" [4].

Such a combination of procedures will not result in answers to those basic questions to which answers are not possible, but it can keep the questions alive and open, and contribute to professional growth within them.

In closing, allow me to confess to a pervasive personal bias. It is that most current graduate programs are too much programs of training, rather than of education. That they should be predominantly programs of training I have somewhat reluctantly come to accept. But they go too far. Instead of turning out broadly competent *persons* well equipped with certain analytical tools, they tend to turn out analytical machines, with sensitive perceptors finely tuned to interpret nearly all aspects of human affairs solely in terms of the concepts and variables of a particular discipline. By insisting on such an exclusive concentration on developing tool-using competence, whether those tools are mathematical or not, the result is a high degree of sophistication within a very narrow range of understanding, coupled with the vestigial remains of a much more elementary exposure to other fields of knowledge and analysis at a much younger age. For a long time it puzzled me that Frank Knight, one of my professors whom I regarded most highly, with his keen perception of so many problems was so scathingly sarcastic and seemingly naive with respect to anything religious. Finally I learned that as the son of a small-town minister he was so repelled by Sunday School at an early age that he never delved into Christianity with understanding again during all of the years he was becoming so extensively knowledgeable in other fields. I submit that no matter what the fare may be at the high school and undergraduate levels, if we insist on the graduate student years being devoted exclusively to narrowly specialized *training,* it will, in general, effectively outrun and smother a healthy understanding of and respect for other fields of knowledge. And many of those other fields of knowledge are of high importance with respect to many of each scholar's own objects of study. They probably are even more important to her emergence as a mature human being and constructive citizen.

Many of our most outstanding colleagues have overcome that handicap later on, but they have done it, I am convinced, in spite of the system of graduate study rather than because of it. Is this inevitable, or might it be changed?

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The Market for Economists

FRANCIS M. BODDY

THE program for these meetings states that this session's purpose "is to explore the implications of economic growth and changes in economic organization on the demand for economists and agricultural economists," and I am responding with this paper on the market for economists. I must begin by a disclaimer. I do not believe that my presentation fully responds to the charge in the prospectus, although perhaps a charitable audience may consider that it contributes something to that objective.

I shall cast this presentation in terms of the topics in the principles course—supply, demand, and price—and suggest some interpretations of the recent patterns and changes and some implications of and for future prospects. My colleague, Helmberger, and I have made a modest attempt at the coordination of our efforts, and as a result I will try to add some supplementary data and comments on the general features of the market, and, more especially, summarize and comment on some less public data that comes to me as a result of a continuing annual survey of the major Ph.D.-producing departments of economics and of agricultural economics in the United States. Sixty-one departments of economics and 24 departments of agricultural economics are on the current survey list.

Economics and agricultural economics have not closely matched their trends in enrollment for advanced degrees in recent years and they differ also from the trends shown in the enrollments in all fields.

Using the Office of Education reported fall quarter data in *Students Enrolled for Advanced Degrees* and computing the average annual rates of increase for the last reported four years and for the last 10 years, yields the figures shown in Table 1. Similar computations on the Office of Education reported data in *Earned Degres Conferred* yield the results shown in Table 2.

It is to be noted that the expansion of enrollments, both first year and total, for advanced degrees was at lower rates during the last four years (with one exception) than for the decade as a whole and that this pattern was clearer and stronger for economics and for agricultural economics than for all fields.

Table 1. **Enrollment for advanced degrees, annual rates of increase (percent)**

	Fall 1966 to Fall 1970		Fall 1960 to Fall 1970	
	First Year Enrollment	Total Enrollment	First Year Enrollment	Total Enrollment
Economics	5.3	6.3	7.9	8.6
Agricultural Economics	1.5	3.8	5.3	5.1
All Fields	9.2	10.1	10.3	10.0

Expansion of the number of advanced degrees in agricultural economics shows the same general pattern: substantially lower growth rates for the last four years than for the decade. In economics and in all fields, M.A.'s granted show this same pattern, but the output of Ph.D.'s in the last four years increased more rapidly than for the decade as a whole.

Replies from the Ph.D.-producing departments responding to my annual survey of major departments of economics and of agricultural economics include data on enrollment and advanced degrees granted for the reporting departments, for more recent years. Rates of change in these statistics for the reporting departments are shown in Table 3.

These data show general declines from 1969–70 to 1970–71 in total graduate enrollments and, even more so, in *new* graduate enrollments in the reporting departments in both economics and agricultural economics. The enrollment data for the years 1970–71 and 1971–72 show very substantial continuing declines in *new* graduate enrollment in all the categories, particularly so in the top ranked economics departments. Graduate degrees granted by the major departments of economics show declines from 1969–70 to 1970–71 in all groups (except for a

Table 2. **Advanced earned degrees granted, annual average rates of increase (percent)**

	1965–66 to 1969–70	1959–60 to 1969–70
Economics		
M.A.	5.4	10.1
Ph.D.	14.8	12.9
Agricultural Economics		
M.A.	2.1	3.5
Ph.D.	7.2	9.1
All Fields		
M.A.	10.4	10.9
Ph.D.	13.1	11.8

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Table 3. Graduate enrollments and graduate degrees granted, percent changes in

	Graduate Enrollments				Graduate Degrees Granted 1969–70 to 1970–71	
	1969–70 to 1970–71		1970–71 to 1971–72			
	Total	New	Total	New	Ph.D.'s	M.A.'s
Economics						
Top ranked[a] departments	−4.4	−8.5	−3.4	−17.0	−8.2	+0.6
Other reporting departments	−0.4	−5.1	+3.9	− 8.0	−0.8	−9.1
All reporting departments	−3.1	−6.4	−1.1	−14.7	−5.7	−3.2
Agricultural Economics						
All reporting departments	−3.3	−12.1	+0.3	− 1.2	+27.7	+3.3

[a] Three highest reputational ratings in the Roose-Andersen report, 29 departments; these departments produce about 60 percent of the current total output of Ph.D.'s in economics

negligible increase in M.A.'s in the top ranked group), but show increases in both degrees in the reporting departments of agricultural economics.

The substantial reduction in the number of Ph.D.'s granted by these reporting economics departments from 1970–71 to 1971–72 may be in part the effect of a piling up of Ph.D.'s granted in 1970–71; the number rose from 634 in 1968–69 to 794 in 1969–70 in the total for all Ph.D.-granting departments of economics (as reported by the Office of Education). This surge in total output, an increase of 160, was made up of an increase of 102 (or of 22 percent) in the output of the top-ranked departments and of 58 (or of 27 percent in the output of the other departments. This one-year surge in output may be in part the result of programs to speed up completion of the Ph.D. degree and also to added pressures in 1969–70 for completion before the market showed further softening. This surge may account for the resulting actual decline in output in 1970–71.

In general I would interpret the recent figures on graduate enrollments and on graduate degrees granted in economics as indicating that as early as 1968–69, and especially in the major departments, feedback from the market began to generate some decline in new graduate enrollments and in total graduate enrollments and by 1970–71 had generated declines in the output of both Ph.D.'s and M.A.'s in the major economics departments. The continued decline from 1970–71 to 1971–72 in *new* graduate enrollments suggests that for the major departments the lower levels of output of Ph.D.'s may continue for some years to come. This may not yet indicate a decline in total economics Ph.D. output, however, for the smaller established departments and the newly emerging departments which have recently implemented Ph.D. programs are not included in my survey, and therefore I have no 1970–71 data on them. It is clear that the total economics Ph.D. output of these departments will show increases in 1970–71 and in later years, and this may offset or more than offset the current and prospective continuing decline in the output of the larger and particularly the higher ranked departments of economics.

In agricultural economics the pattern is not quite so clear, but at least a turndown in the larger departments in both new enrollments and total enrollments has occurred, and perhaps the surge upward in the output of Ph.D.'s in 1970–71 in the departments reporting in my survey is a one-year-later replica of the pattern in economics. In agricultural economics, unlike economics, I do not believe there are many substantial "new producers" about to add to the market supply of either M.A.'s or Ph.D.'s.

In general, then, I would suggest that predictions made on the basis of projecting the output trends of the decade of the 1960's may substantially overestimate the total new supply of advanced degree holders coming onto the market in this year and for the next few years in economics and in the totals of economics and agricultural economics. While new producers of Ph.D.'s may be coming on-line this year or in a few years, I think it unlikely that their output will have substantial effect on the totals for at least a few more years.

It is worth noting that the 29 long-established and top-ranked departments produced 60 percent of all Ph.D.'s in economics in 1969–70 and that the addition of the 16 departments rated as at least "adequate plus" in the Roose-Andersen report raises the figure to over 70 percent of the total. It is also worth noting that there has been a gradual decline over the decade from the 82 percent of the total produced by these 45 departments in 1959–60 to the 70 percent in 1969–70, although the absolute increase in the yearly output of the some 55 non-rated (in Roose-Andersen) departments amounted to but 193 over the ten-year period, compared to an increase of 365 in the output of the rated departments.

With respect to the supply side of the market for economists, therefore, I think the following conclusions may be tentatively accepted:

(1) The perception in the last few years of a softening market developing for the fresh new Ph.D.'s in economics had a rather immediate feedback effect on the entering and total enrollments in the production lines of at least the major departments of economics;

(2) The growing acceptance of a perception of a continuing softening in the market by 1968–69 may explain the rapid upsurge in Ph.D. output in 1969–70, with its after-effect the substantial decline (at least in the surveyed departments) in 1970–71;

(3) Unless the new producers waiting in the wings surprise us with a large and immediate increase in total new supply, the output rates of Ph.D.'s in economics and agricultural economics will not rise nearly as rapidly as extrapolation of the overall growth rates in the 1960's have suggested.

I believe also, however, that some restraints on input and output by some of the major departments were influenced by other considerations than the immediate market prospects for their products. Among these considerations were (1) the slowing down, and then the absolute decline in fellowship funds, both from internal and external sources (fellowships for graduate students in the 51 departments of economics reporting this statistic in my survey declined from 2550 in 1969–70 to 2312 in 1971–72, or by 9.3 percent over the two years; fellowship support had actually peaked two years earlier in 1967–68 according to an earlier study of similar data); (2) the growing concern about possible overexpansion in size with consequent losses in effectiveness and in the community relationships among and between the faculty and graduate students; and (3) the overall institutional financial constraints that became more and more a restraining influence on general expansion in both private and public institutions of major rank in the later years of the decade.

On the demand side of the market for economists, there are less data available, but the general pattern of where "economists" work is clear from the data we do have. From data from the studies of NSF of the 1970 National Register, it is clear that educational institutions employ the majority of all economists (including those with bachelor's, master's, and Ph.D. degrees).

The percent distribution for 1970 for the economists in the Register is shown in Table 4. From the survey data of major departments of economics, the pattern of placement of the last two years' output (1969–70, 1970–71) has the following characteristics:

(1) Only 15 to 20 percent of the output of Ph.D.'s reported by 27 of the 29 high ranking departments (about 350 per year) went to departments within this group of 29.

(2) In 1970–71, just 34 percent of their output went to departments of economics that have Ph.D.-producing programs, and an additional 39 percent went to non-doctoral-producing departments in the United States, or to foreign academic institutions.

(3) The output of the lower ranking surveyed departments (about 120 per year) was divided in 1970[71: 18 percent to Ph.-D.-producing U. S. departments, 55 percent to non-doctoral-producing departments in the U. S. or to foreign academic institutions.

(4) For both groups and both years, the remaining roughly one-quarter of the output went to non-academic U. S. or foreign positions.

Table 4. Percent distribution of economists, 1970, by level of degrees and by type of employer

	B.A.	M.A.	Ph.D.	Total	Number of Economists
Educational Institutions	22.6	42.5	75.4	58.6	7,845
Government	33.8	20.6	10.9	16.4	2,197
Non-profit Organizations	5.0	4.0	3.8	4.0	530
Business	29.9	20.2	6.4	13.6	1,822
Self-employed	2.9	1.9	1.1	1.6	214
Unreported	5.8	10.8	2.4	5.8	778
Total	100.0	100.0	100.0	100.0	13,386
Number of economists	1,082	5,008	7,225	13,386	

Table 5. Change (percent) in academic salaries 1971–72 over 1970–71

	AAUP Data		Departmental Survey Data	
	Institution-Wide			
	All institutions (less Category IV)[a]	Universities granting over 100 doctorates per year	Economics departments	Agricultural economics departments
Professors	+3.3	+3.1	+3.4	+5.6
Associate Professors	+3.5	+3.6	+4.2	+1.1
Assistant Professors	+3.7	+4.0	+3.4	+3.3
New Ph.D.'s	—	—	+2.1	+2.5

[a] See the AAUP 1972 report of Committee Z.

Although the National Register might naturally show smaller foreign employment, compared to the survey data on where completed Ph.D.'s went, the patterns are consistent in showing about 75 percent of the Ph.D.'s in economics in (or going into) academic institutions. These high proportions in academic institutions are not strikingly different from the patterns shown by a similar study of earlier years. The analysis of economics Ph.D.'s produced in the survey departments and whose placement was reported in 1966 to 1969 in the survey (a total of 1100 Ph.D.'s) showed that less than one-quarter of the placements were to departments rated in the Cartter study and that a total of 78 percent went to U. S. and foreign academic position.

The placement of the 1970–71 output of Ph.D.'s by the agricultural economics departments responding to my survey (reporting departments produced 129 Ph.D.'s and the institution of placement was identified for 108 of these 129) was somewhat similar to that in economics. Twenty-seven percent went to Ph.D.-producing departments and 32 percent went to other U. S. or to foreign academic institutions for a total of about 60 percent to academic institutions and 40 percent to non-academic positions, of which a little over one-half went into U. S. or state/local government. The proportion of placement of new Ph.D.'s in academic institutions is somewhat lower than for economics and is lower than the National Register data show for this type of employment of all Ph.D.'s in agricultural economics, which (at 76 percent in academic institutions) is practically the same as in economics.

While recent placement of new Ph.D.'s in these fields shows a continuing emphasis on academic employment, there have been some shifts within this broad area over the last few years. While it was never true that the Ph.D.'s produced by the major departments of economics largely were placed in similar institutions, there have been somewhat larger proportions of "downstream" placement in the last few years. Not only has the placement in non-Ph.D.-producing departments risen somewhat, but in last year's lists, the number of placements in state colleges, and particularly in community and junior colleges, became a less than rare event.

The price of economists has, in the post-war period, shared in and in the early years outpaced, the general rise in academic (and civil service) salary scales, but this steady upward movement has begun to slacken, largely the result of a weakening market, and tighter fiscal restraints in academia in the last few years. While general academic salaries have been increasing lately, the rate of increase has substantially declined, and 1971–72 salary level increases in many institutions did not even match the rise in the cost of living indices.

The record for 1971–72 advances over 1970–71 can be sketched in with some data from the AAUP 1972 report of Committee Z (and the supplementary tables of that report) and data from my last year's survey of the major departments (Table 5). Rates of increase in academic salary levels for economists, agricultural economists, and academics in general are distinctly lower for 1971–72 over 1970–71 than for 1970–71 over 1969–70; economists' and agricultural economists' salaries show no distinctively different patterns of change than are shown by the institution-wide averages. The departmental survey data shows but very modest increases in 1971–72 in the salaries of "new Ph.D.'s," and the average of departmental forecasts of the levels in 1972–73 predicts at best only modest increases next year for this group.

At least for that part of the market for economists and agricultural economists that involves the highest levels of academic training, one may conclude that the market is working, that the market supply seems to have responded in a relatively timely fashion to the developing consensus forecast of the mildly softening market, and that the immediate future is not to be one of a "rising glut of Ph.D.'s" in these fields, or perhaps indeed in most other fields. The output of recently developing graduate programs will add an unknown but probably not a critical increase in supply, but even if, as seems likely, the market will not be strong, this growing supply of new entrants is more of an indication of the likely problems of demand adjustment and perhaps price adjustment, than of a forecast of unemployment or real underemployment of these Ph.D.'s.

The market for economists involves relatively small numbers. The GI bulge after World II peaked at the B.A. level at 14,573 in 1949–50, fell off to less than half that in the mid-1950's, and by 1969–70 was only 18 percent above the level of 1949–50. At the master's degree level the output peaked in 1947–50 at about 920, declined to about two-thirds of that level in the mid-1950's, and by 1969–70 was at about 2,000. The Ph.D. output peaked at about 300 in 1955–56, declined to a low in 1958–59 (at 221), and by the 1969–70 stood at 794. There is evidence that that figure represents only a one-year surge.

In agricultural economics the numbers are really quite small. B.A. output in 1957–58 was at a little over 600 and in 1969–70 was only 1,067. M.A. production in 1958–59 was at a little over 300 and in 1969–70 was only 406. Ph.D. output was 77 in 1956–57 and stood at 181 in 1969–70. Recent levels of Ph.D. output in both these fields are about only 1,000 per year and show more indication of a leveling-off or decline than of continued rapid increase.

I suggest that the problem, particularly for new entrants, may be more of the slowness of the demand side to react to the changing supply situation, rather than a basic failure of demand. Many academic institutions that believed well-trained Ph.D. types were either not available or too expensive for them to compete for, now are beginning to view the market differently.

While the non-academic market has been and still is the smaller sector, it is likely to respond substantially to the increased availability of highly trained economists, particularly state and local government, regional governmental and non-governmental agencies, and firms and business groups, where the problems of "third-party costs" have achieved a high public agenda position, and much political interest and potential payoff lie in their analysis and in effective steps towards solution. Furthermore, the increasing demand for accountability accompanied by an increasing sophistication in the questions raised and the levels of analysis required to respond effectively suggests an expanding field for the exercise of the skills of the economist.

While I do not believe the prospects of the market for economists are disheartening, either to those faculty in graduate programs, or to the students or prospective students, I do believe that the future will be somewhat different from the past and that there are some questions that should be on the current departmental and professional agendas.

(1) Are the graduate programs in our fields the best we can devise and operate to prepare the students most effectively for their likely careers?
(2) Are the graduate programs sufficiently broadly and deeply based so that the students are best prepared to change emphasis and direction as the public and intellectual priorities change and new fields of application come to the fore?
(3) Can we better inform prospective students about the likely market situation that they may face on completion of their programs?
(4) Can we maintain the basic strengths of the graduate departments and programs, and of quality graduate education in general, in the face of the current prospects of slower growth for the next decade, less mobility, the impact of intra-institution reallocation of resources and of zero-base and program budgeting, and financial austerity in the institutions which will probably continue to be a major sector of the demand for economists?

The scare talk about the current and prospective general "Ph.D. glut" is greatly overdrawn. The unemployment or even the underemployment of Ph.D.'s is substantially lower than for less fully trained professionals and is largely confined to a relatively few fields across the broad range of graduate training.

In economics and agricultural economics the prospects are far less discouraging than in most other fields. The market for economists and agricultural economists at least has demonstrated that a fairly effective feedback system is operating in the market; better, and better utilized, information on the current and prospective market situation could perhaps improve its response, and the rationality of the response, to the developing scene.

The Market for Agricultural Economists*

John D. Helmberger

What is an agricultural economist? How many of them are there? For whom do they work? What do they do? What are they paid? What is the demand for their services? What is the supply? What is the demand and supply outlook? What response should be made to it? It is hoped that the paper will shed light on the answers to these questions. No pretense is made that definitive answers are given. None can be given.

What are Agricultural Economists?

Since agricultural economists are a subset of economists, let us begin by defining economists. *Academicians* define economists as holders of graduate degrees in economics (many would exclude masters). The Bureau of the Census and the National Science Foundation (NSF) have broader definitions which include some who have only a bachelor's degree. Some would use an even broader definition which would include all or nearly all holders of bachelor degrees with economics majors or even minors [10, 11].

The Bureau of the Census included 22,424 economists in the "experienced labor force" in 1959 (1960 Census). The academic economist count by the Bureau of the Census is about the same as NSF's, but the non-academic count is greatly different [10, p. 14]. In 1968 and 1970 NSF's definition of an economist (actually supplied by the American Economics Association cooperating with other professional associations, including the American Farm Economics Association) was one who holds a bachelor's degree in economics with two years of professional experience; or a graduate degree in economics; or the equivalent in professional experience [7, p. 247]. Since 1966 NSF listed 101 economics specialties of which the first 12 have been in agricultural economics [7, p. 257]. If an individual met the 1970 definition of an economist and listed one of the 12 specialties (agricultural demand and supply analysis, agricultural situation and outlook, agricultural policy, agricultural finance, agricultural marketing, farm management, land reform, conservation of natural resources, forestry, fisheries, water resources, and other agricultural economics) as his highest ranked specialty, he is registered as an agricultural economist.

NSF's method of reaching professionals for the Register (getting lists from professional associations) results in contacting almost all of the Ph.D.'s, perhaps most masters, but probably a minority of bachelors—and covers academic economists much better than others. The latter is particularly true of economics or agricultural economics. The number of professionals included in NSF's Register by degree held, for all professionals, economists, and agricultural economists is given in Table 1. Notice that the bachelor degree is the highest degree held by roughly 27 percent of all professionals while about 8 percent of the economists and less than 7 percent of the agricultural economists are in this class. Apparently the bachelor degree represents a higher level of professional competence in many fields than it does in economics, or "bachelor economists" are less likely to belong to professional associations and, hence, to be included in the NSF register or both.

My mission here is to give some background for curricular revision at the undergraduate level as well as the graduate level. A definition of economists broad enough to include most of the holders of bachelor's degrees who also have or seek jobs which utilize their education is one which the Bureau of Census is trying to employ. In 1962 Ewan Clague estimated that there were about 20,000 economists in 1961 and projected about 30,000 for 1970 [4]. The *Occupational Outlook Handbook*, 1969–70 edition, reports about 31,000 economists employed in 1968. The 1970 Census of population will likely give us a better estimate of the number of professional economists (broad definition) than is available now.

For Whom Do Economists Work and What Do They Do?

What are the roles of the 13,386 economists included in the 1970 Register? Table 2 shows the distribution of economists and agricultural economists by highest degree held, among various types of employers. Fifty-nine percent of all Register economists work for educational institutions, 16 percent for government, mostly federal government, and 14 percent for business (see last

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* The author wishes to acknowledge the contribution of research assistants Jerry Thompson and Allan Michael.

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Table 1. **Distribution of all scientists, economists, and agricultural economists, by highest degree held, 1964, 1968, and 1970[a]**

Year	Group	Ph.D. Degree Number	Percent of Total	Masters Degree Number	Percent of Total	Bachelors Degree Number	Percent of Total	Total Professionals Number	Percent
1964	All professionals	79,372	35.45	61,222	27.35	72,364	32.33	223,854	100.00
	Economists	5,091	41.93	4,204	34.62	2,613	21.52	12,143	100.00
	Agricultural economists	657	52.39	483	38.52	103	8.21	1,254	100.00
1968	All professionals	111,206	37.32	86,717	29.11	89,141	29.92	297,942	100.00
	Economists	6,112	53.10	4,306	37.42	1,027	8.92	11,510	100.00
	Agricultural economists	763	54.70	540	38.71	91	6.52	1,395	100.00
1970	All professionals	125,234	40.06	93,540	29.92	83,740	26.78	312,644	100.00
	Economists	7,225	53.98	5,008	37.41	1,082	8.08	13,386	100.00
	Agricultural economists	863	57.50	540	35.98	96	6.42	1,501	100.00

[a] Sources: [5, 7, 10].

section of Table 2 for detail). Of the agricultural economists, 55.5 percent are employed by educational institutions, 30 percent by government, being even more concentrated at the federal level, and only 6 percent work for business. A large majority of the "Register" economists are capable of carrying on or directing research, defining economic problems and solving them, teaching economics in college, or filling positions in government and business involving policy formulation, planning, and decision making.

Table 3 shows the distribution of economists and agricultural economists by type of primary work done. Economists generally are engaged primarily in teaching (39 percent), management and administration (22 percent), and research

Table 2. **Economists and agricultural economists, 1970, by highest degree held and by type of employer[a]**

Type of Employer	Economists[b]				Agricultural Economists			
	Ph.D.'s	Masters Number	Bachelors Employed	Total[c]	Ph.D.'s	Masters Number	Bachelors Employed	Total[c]
Educational institutions	5449	2127	245	7845	626	191	16	833
Government: Federal	509	724	270	1513	156	209	48	413
Other government	277	307	96	684	13	21	4	38
Non-profit organizations	273	202	54	530	28	14	5	48
Business	466	1014	323	1822	22	56	14	93
Self employed	81	95	31	214	5	12	2	19
Totals[c]	7225	5008	1082	13,385	863	540	96	1501
	Percentage Distribution by Highest Degree Held by Employer							
Educational institutions	69.46%	27.11%	3.12%	100%	75.15%	22.93%	1.92%	100%
Government: Federal	33.64	47.85	17.85	100	37.77	50.61	11.62	100
Other government	40.50	44.88	14.03	100	34.21	55.26	10.53	100
Non-profit organizations	51.51	38.11	10.19	100	58.33	29.17	10.42	100
Business	25.58	55.65	17.73	100	23.66	60.21	15.05	100
Self employed	37.85	44.39	14.49	100	26.32	63.16	10.53	100
Totals[c]	53.97	37.41	8.08	100	57.49	35.98	6.40	100
	Percentage Distribution by Employer by Highest Degree Held							
Educational Institutions	75.42%	42.47%	22.64%	58.61%	72.54%	35.37%	16.67%	55.50%
Government: Federal	7.04	14.46	24.95	11.30	18.08	38.70	50.00	27.51
Other government	3.14	6.13	8.87	5.11	1.51	3.89	4.17	2.53
Non-profit organizations	3.78	4.03	4.99	3.96	3.24	2.59	5.21	3.20
Business	6.17	20.25	29.85	13.61	2.55	10.37	14.58	6.20
Self employed	1.12	1.90	2.86	1.60	.58	2.22	2.08	1.27
Totals[c]	100	100	100	100	100	100	100	100

[a] Source: [7].

[b] Agricultural Economists are a subset of Economists.

[c] Detail does not add to total because of unemployment status, military service, incomplete reporting, or the existence of economists who have no degree.

Table 3. Primary work activity of economists and agricultural economists, 1970[a]

	Numbers Employed			
	Economists[b]	Percent of Total	Agricultural Economists	Percent of Total
Research and development	2746	20.51	627	41.77
Basic	(782)	(5.84)	(85)	(5.66)
Applied	(1840)	(13.74)	(524)	(34.91)
Management and administration	2937	21.94	360	23.98
Teaching	5288	39.50	252	16.79
Production and inspection	186	1.39	29	1.93
Consulting	463	3.46	42	2.80
Exploring, forecasting, reporting	532	3.97	55	3.66
Totals[c]	13,386	100	1,501	100

[a] Source: [7].

[b] Agricultural Economists are a subset of Economists.

[c] Detail does not add to total because of unemployment status, military service, incomplete reporting, or the existence of economists who have no degree.

and development (21 percent). Agricultural economists are engaged primarily in research and development (42 percent), management and administration (24 percent), and teaching (17 percent). Agricultural economists (in proportion to their numbers) engage in research more than twice as much as other economists and less than half as much in teaching. In basic research they are represented proportionately, but agricultural economists are represented more than twice as much in applied research.

What is the role played by "bachelor" economists? The vast majority of them obtain jobs in business or junior level jobs with government. The former generally do not work as economists but as salesmen or in management (as trainees at first). The latter work as junior economists under the supervision of graduate or experienced economists, learning more economics along the way until they reach the supervisory level in turn. The roles these "bachelor" economists play may require more training in analysis (economic theory, mathematics, and statistics), in other social sciences, or in both than they are currently getting in many universities.

Demand For Agricultural Economists

Since the academic component of the total demand for Register agricultural economists is so large (see Table 2), it is probably useful to examine the academic demand and predicted changes in it to get some indication of the future demand for agricultural economists.

Professor Willis Peterson predicts an increase of 157 in the number of agricultural economists engaged in teaching and research between 1967 and 1974 in U. S. colleges of agriculture and experiment stations [9]. No projection was made for the number of extension personnel in 1974. Assuming their numbers grow proportionately, 78 more extension economists would be employed. It is estimated that 235 more agriculture economists would be needed. Also, 226 would be needed for replacement, assuming a rate of 2 percent which is used by NSF and Cartter and Farrell [3].

Even if all the 461 agricultural economists employed for *replacement* and *expansion* of staff were to be Ph.D.'s, only a small percentage of the projected new Ph.D.'s will find places on staffs of departments of agricultural economics. The actual number of Ph.D.'s in agricultural economics awarded in 1967–69 and 1968–69 was 339. Using this number with the projected number of Ph.D.'s to be awarded in the period 1969–74, using the lowest projections, yields 1304 as the total number of Ph.D.'s in agricultural economics to be awarded in the seven-year period (see Table C in the Appendix). Only 35 percent of the new Ph.D.'s would join agricultural economics department staffs if only Ph.D.'s were employed by educational institutions. Unless production of new agricultural economics Ph.D.'s slows and/or academic demand increases dramatically, the relative share of new Ph.D.'s going to U. S. colleges of agricultural and experiment stations will fall sharply. If the agricultural economics profession is to maintain its earnings, other components of the demand for agricultural economists must grow rapidly to allow for the decreasing relative importance of colleges of agriculture as employers of new Ph.D.'s. The educational institution demand (especially the *extension* component) will depend upon the extent to which agricultural economics departments seek new clientele.

Business, industry, and governmental components of the total demand for agricultural economists are harder to project, largely because there seems to be a scarcity of historical employment records from those sectors. The governmental component would be tied to the fate of the USDA and influenced by the same set of factors that influences extension departments of U. S. colleges of agriculture.

It seems exceedingly difficult to say much with respect to future business demand except that it might be more elastic than the demand of government or educational institutions. If this is true, business and industry would be more important employers of agricultural economists as the need for know-how in economics is more widely recognized and the price of agricultural economists becomes more favorable to the user.

Projecting the total college demand in all fields for staff and researchers involves such factors as: (1) the increasing percentage of high school students who graduate; (2) the increasing percentage of high school graduates who go on to college (there are, of course, many qualified, or potentially qualified, students among the disadvantaged who can attend only with special financial and other assistance. Is the money forthcoming?); (3) the increasing ratio of professionals to non-professionals and the increasing incomes of the non-professionals relative to professionals which has already occurred in some areas and will spread to other areas if college enrollment continues to increase; (4) the increasing reluctance of legislatures to finance employment of staff for research and/or increasing the number of teachers to reduce the student-teacher ratios and to subsidize student attendance; and (5) the increasing enrollment in junior colleges and state colleges relative to universities; the student-teacher ratio is higher in state colleges than in universities and still higher in junior colleges.

The above situation generally applies to college demand for professionals. As for the college demand for agricultural economists, some specific factors are relevant. There is room for expansion of the domain of agricultural economics (1) into international agriculture where considerable expansion has taken place and more expansion depends on whether the federal government and/or foundations will finance it; (2) into research and extension work on problems of rural poverty (there is much need for expansion here but not enough legislative response); (3) into rural development and resource economics; (4) into consumption economics; and (5) into research and extension work on urban problems.

It should be noted that a ray of sunshine is coming in from Canada. Gilson reports that between 1969–1975, agricultural economics departments of Canadian universities and governments will provide an average of 43 new positions per year for agricultural economics Ph.D.'s of which Canadian universities can supply only 10–12. It would appear that this might be a good market for 10–15 percent of our new agricultural economics Ph.D.'s (see Appendix Table C). In June 1969 there were 22 unfilled positions for agricultural economics Ph.D.'s in agricultural economics departments of Canadian universities and governments. The average starting salary for these positions was $14,457—not too different from the median salary paid to U. S. agricultural economists in 1968, $15,000 (see Table 4) [5].

Table 4. Number and salaries of all professionals, economists, and agricultural economists, 1964–70[a]

Year	All Professionals		Economists		Agricultural Economists	
	Number	Median Salary[b]	Number	Median Salary[b]	Number	Median Salary[b]
1964	223,854	$11,000	12,143	$12,000	1,254[c]	$11,300
1966	242,763	12,000	13,150	13,100	1,678[d]	12,800
1968	297,942	13,200	11,510	15,000	1,395[e]	15,000
1970	312,644	15,000	13,386	16,300	1,501	17,200

[a] Sources: [6, 7, 11].

[b] Median salaries for those who reported salaries. It should be emphasized that these are not incomes, nor even professional incomes. For those employed by educational institutions for the academic year, only the academic year salary is included. Payments for teaching in summer school or general extension or other professional work done during the summer or otherwise are not included.

[c] Agricultural Economists defined as Land Economists.

[d] Agricultural Economists defined as Agricultural and Land Economists.

[e] Agricultural Economists defined as Agricultural and Natural Resource Economists.

Table 5. Mean salaries, 9–10 month basis, for agricultural economists and other economists, 1969–70 and 1970–71, for major Ph.D.-producing universities[a]

	Mean Salaries of Professors		Percent Change	Mean Salaries of Assoc. Professors		Percent Change	Mean Salaries of Ass't. Professors		Percent Change
	1969–70	1970–71		1969–70	1970–71		1969–70	1970–71	
Agricultural economists	$16,863	$17,919	+6.3	$13,976	$15,001	+7.3	$12,022	$12,650	+5.2
Other economists	20,891	21,952	+5.1	15,002	15,652	+4.3	12,309	12,869	+4.5

[a] Survey of 54 departments of economics and 27 departments of agricultural economics made by Francis M. Boddy, Associate Dean, Graduate School, University of Minnesota. The data result from 51 reporting economics departments and 22 reporting agricultural economics departments.

The demand for economists and for agricultural economists has been adequate relative to the supply in recent years as the salary trends show in Table 4.

The salaries of both economists in general and agricultural economists had been higher and rising faster than those of all professionals. Salaries of agricultural economists had been lower than those for other economists but have risen faster, caught up in 1968, and were higher in 1970. It seems that current production of economics and agricultural economics Ph.D.'s relative to growth in demand will dampen the growth in their salaries but the same is true for salaries in most other professions.

The above comparison of salaries resulting from the NSF's report probably surprises many of us. Representing land grant colleges, as most of us do, we are well aware of the fact that our institutions' economists are often paid more than we are. Dean Boddy (University of Minnesota, Graduate School) has been making annual surveys of the 54 universities which produce the vast bulk of economics Ph.D.'s, obtaining information on salaries by academic rank, salaries of newly hired Ph.D.'s, and information on numbers of graduate and undergraduate students and output of Ph.D.'s. He has done the same thing for the 27 land grant colleges which produce most of the agricultural economics Ph.D.'s. The salary information reported by NSF is basic salary for 9–10 months for those with the school year contract and 12 months salary for those with calendar-year contracts. Professors supplement their incomes in the summer by teaching in summer school and in general extension, by doing research, or consulting, but these supplements are not included. So Professor Boddy adjusts calendar year salaries to 9–10 months which shows agricultural economists' salaries substantially below those of other economists. However, even if he did not do this, we find that agricultural economists' salaries for 12 months for each rank are sometimes lower than other economists' salaries for 9–10 months in the major Ph.D.-producing universities.

Nearly all academic agricultural economists have calendar-year contracts while the vast majority of other economists have 9–10 months contracts. This doubtless explains much of the fact that the median salaries of agricultural economists are higher as reported by NSF. However, other factors are also involved. Nearly all academic agricultural economists are employed by large land grant universities where salaries generally are higher than for other four-year state colleges, most private colleges, and junior colleges. These other categories employ many economists but very few agricultural economists. Also, a larger percentage of academic agricultural economists have Ph.D.'s than is true for other economists (75.15 percent vs. 69.46 percent in 1970–see Table 2), and they are older and have more professional experience, both of which are positively correlated with salaries. Even among land grant universities, the scales are tipped more favorably toward economists when one considers that the 9–10 month economists have more time to supplement their basic salaries performing other professional work and they do so [11, especially pp. 34–36].

Dean Boddy's survey compares salaries, 9–10 month basis, for agricultural economists and other economists for the major economics and agricultural economics Ph.D.-producing universities in Table 5.

The Supply of Agricultural Economists

A majority of all degree-holding agricultural economists included in NSF's Register are doctorate holders (863 out of 1,501 or 57.49 percent). Master's degree holders are also a relatively important component (540 out of 1,501 or 35.98 percent) of the total, while bachelor's de-

Table 6. Number of degrees, bachelors, masters, and doctorates, in economics and agricultural economics projected for the decade, 1969–1979[a]

Degree	Projection 1	Projection 2	Projection 3
	Economics		
Bachelors	212,416	202,646	191,974
Masters	29,269	32,305	31,861
Doctorates	8,806	10,977	10,873
	Agricultural Economics		
Bachelors	10,888	11,646	12,768
Masters	4,930	6,832	8,657
Doctorates	2,160	2,913	3,260

[a] See Appendix for detail.

gree holders are a relatively small fraction of the total number of degreed agricultural economists in the sample (96 out of 1,501 or 6.4 percent) (see Table 2).

One would expect nearly all doctorate holders to seek (and presumably find) employment as professional agricultural economists. A large fraction of terminal masters holders and a very small fraction of terminal bachelors holders would be expected to seek such employment.

Since the relative fraction of each degree group that eventually becomes agricultural economists is not known for the recent past, and since those fractions would be expected to change with changing market conditions, it is very difficult to project anything other than the potential supply of agricultural economists—that is, those who might conceivably enter the market, less those who leave through death, retirement, or net loss via leaving the profession. Accordingly, projections of the *total* number of new agricultural economics bachelor, master, and doctorate degrees by year were made based upon the number of degrees in each category awarded in the recent past as recorded by the U. S. Office of Education's *Earned Degrees Conferred* series (see Appendix).

Three different projections were made for the number of bachelor, master, and Ph.D. degrees in economics and agricultural economics to be awarded for the period 1969–1979. Projection 1 is a linear regression of the number of bachelors (and master's and Ph.D.'s) degrees awarded during the period 1959–1969; projection 2 assumes that the ratio of bachelor's (and master's and Ph.D.'s) in agricultural economics to total degrees (as projected by U. S. Office of Education) will be the same as the ratio for the period 1966–1969; and projection 3 assumes that the ratio of agricultural economics degrees to total degrees will be the same as the ratio for 1959–1969. The total number of bachelors, masters, and doctorates projected for the 1969–1979 period is given in Table 6 (see Appendix for detail).

The total supply of agricultural economists would not rise as fast as the total number of degrees awarded in agricultural economics because about 2 percent of the total number of agricultural economists need to be replaced each year; most of the bachelors and many of the masters do not accept jobs as agricultural economists; and many bachelors later go on to get master's, and some of these go on to get Ph.D.'s (i.e., the figures involved some double counting).

The Market Outlook

The rapid increase in college enrollment since 1945 is a consequence of the post-war population explosion, the increasing percentage of high school students who are graduated, and the increasing percentage of those who go on to college.

The number of 18-year-olds will peak at about 4,344,000 in 1979 when the number of high school graduates is also expected to peak at about 3,799,000. The population 18–21 will peak at about 17,033,000 in 1980, and the college enrollment (full time equivalent) is expected to peak at about 9,834,000 in 1982 [1, p. 133].

Full time equivalent college enrollment in the 1960's increased 3,390,000 (from 2,913,000 to 6,303,000) or 116 percent while total full time faculty increased 133,000 (from 169,000 to 302,000) or 79 percent. For expansion and replacement, 175,600 new staff members were needed of which 77,200 were Ph.D.'s.

In the 1970's enrollment is expected to increase by 3,234,000 to 9,537,000 or 51 percent (less than half the rate of increase in the 1960's), while total faculty needs increase by 135,000 to 437,000 or 45 percent. The need for new faculty is estimated at 207,500, of which 91,900 must be Ph.D.'s to "maintain the quality of the faculty," i.e., keep the ratio of the Ph.D.'s to total faculty the same.

In the 1980's enrollment is expected to *decrease* 863,000 to 8,674,000 or 9 percent while faculty needs fall 29,000 to 408,000 or 7 percent. Because of replacement, 61,200 new faculty members will be needed of which 26,400 should be Ph.D.'s [1, p. 134].

The number of Ph.D.'s awarded in the 1960's was 173,945 when 77,200 new Ph.D.'s were needed for faculty. The projected Ph.D. awards for the 1970's is 431,200 when 91,900 Ph.D.'s are projected as needed for faculty (see Appendix). More recent projections of Ph.D.'s to be awarded in the 1970's range from 381,000 to 520,000 including projections of U. S. Office of Education (475,000), NSF (392,000), and National Research Council (479,000) [12, p. 785].

Wolfle and Kidd estimate that 60 percent of Ph.D.'s in the 1960's were employed by colleges and that 50 percent of the new Ph.D.'s are now employed by colleges; they estimate 25 percent for the 1970's as a whole. Of those Ph.D.'s who do not get college jobs, a smaller percentage will have R and D positions. In 1969 76 percent of non-college jobs were in R and D. Only about half of such jobs will be in R and D for the 1970's, according to NSF estimates. NSF assumes 95 percent of university appointments in the 1970's and 62 percent of other colleges, including junior colleges, will be Ph.D.'s [12, p. 786]. NSF projects a surplus of 43,000 Ph.D.'s by 1980 and about a 20 percent surplus of social scientists by 1980. (Economists are the largest sub-group among social scientists) [8].

According to Cartter, during the period 1959–69, 3,722 Ph.D.'s were awarded in economics (excluding agricultural economics). Of these, 2,479 were available for teaching and 2,346 were "required." During the period 1969–79, he estimates 9,539 Ph.D.'s will be awarded, of which 6,359 will be available for teaching and 2,596 will be required. Cartter calculates an annual "surplus" for the period 1958–79, the surplus being defined as the ratio of the excess of economics Ph.D.'s available for teaching over the number required to the number of economics Ph.D.'s awarded. This surplus varied from a minus 14 percent (1965) to 23 percent (1962) up to 1969 when it was 29 percent. For all years after that it is higher than 34 percent, reaching 48 percent by 1979 [2].

Agricultural economists and other economists, who are becoming increasingly good substitutes for each other, cannot escape the rather obvious switch from a long-time seller's market to a buyer's market. A very large percentage of the Ph.D.'s are produced by a few large universities with good graduate schools where they hope to teach but little, and that to graduate students, while they spend most of their time at research and publishing. It seems clear that it is our responsibility to make clear that only the best of them (some 20–25 percent) are likely to achieve this dream. Our current curricula with emphasis on quantitative analysis, research methods, and specialization (with perhaps minor modifications) seems appropriate for these and for better-than-average graduate students who aspire to R and D jobs outside of the academic world.

If one is not a considerably better than average graduate student but wants the academic life and wants a teaching or teaching research position, then he had better recognize that he will have to settle for a four-year college or a junior college. The training he receives should be broader than he is getting and should contain less (not more) emphasis on mathematics and statistics and research method. He will be teaching undergraduates and teaching 9–12 hours a week or more, teaching two or even three courses at a time with possibly a different set the next term. He will do little or no research of any significance. More course work in other social sciences, some course work in educational psychology, testing and evaluation, and especially (at least) one term of supervised and directed teaching along with broader economics training will be far more suitable to his needs than his current curriculum in many graduate schools.

Since it is likely that a smaller portion of the non-academic jobs will be in R and D and a larger portion in management and other business jobs, more interaction is needed between universities and business to develop curricula appropriate to needs.

Instead of a graduate program that implicitly assumes that all our Ph.D.'s will teach and *research* at universities, we should recognize that we should have at least a three-track system: the current one, a *teaching* track (for four-year and junior colleges), and a non-academic, non-R and D track. The non-academic non-R and D track might well be to produce a professional master's degree that is deliberately designed to tap this market.

Let me close with a sobering quote from Cartter: ". . . we have created a graduate education and research establishment in American universities that is about 30 to 50 percent larger than we shall effectively use in the 1970's and early 1980's, and the growth process continues in many sectors. The readjustment to the real demands of the next 15 years is bound to be painful" [1, p. 132].

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APPENDIX

Table A: Bachelors and first professional degrees in all fields, economics and agricultural economics, by year, past and projected

Year	All Fields[a]	Economics[b]	Percent Economics	Agricultural Economics[b]	Percent Agricultural Economics
1959–60	394,889	7,488	1.896	613	.155
1960–61	401,784	7,939	1.975	611	.152
1961–62	420,485	8,405	1.998	706	.167
1962–63	450,592	9,399	2.085	732	.162
1963–64	502,104	10,607	2.112	778	.154
1964–65	538,930	10,895	2.022	643	.119
1965–66	555,613	11,585	2.085	689	.124
1966–67	594,862	13,058	2.195	771	.129
1967–68	671,591	15,296	2.277	911	.135
1968–69	769,683	16,907	2.197	1,002	.131

[a] *A Fact Book on Higher Education*, 4th Issue, 1971, American Council on Education, Washington, D.C., P. 71.189.
[b] *Earned Degrees Conferred* Series, U. S. Office of Education (an annual publication).

Year	All Fields[c]	Projection 1 Economics[d]	Projection 2 Economics ($\bar{X}=2.222$)[e]	Projection 3 Economics ($\bar{X}=2.105$)[f]	Projection 1 Agricultural Economics[d]	Projection 2 Agricultural Economics ($\bar{X}=0.131$)[e]	Projection 3 Agricultural Economics ($\bar{X}=0.140$)[f]
1969–70	772,000	16,704	17,154	16,250	934	1,011	1,081
1970–71	801,000	17,712	17,798	16,861	969	1,049	1,121
1971–72	825,000	18,721	18,332	17,365	1,003	1,081	1,155
1972–73	859,000	19,729	19,087	18,082	1,037	1,125	1,203
1973–74	890,000	20,737	19,776	18,734	1,072	1,166	1,246
1974–75	928,000	21,746	20,620	19,534	1,106	1,216	1,299
1975–76	963,000	22,754	21,398	20,271	1,140	1,261	1,348
1976–77	997,000	23,763	22,153	20,987	1,175	1,306	1,396
1977–78	1,029,000	24,771	22,864	21,660	1,209	1,348	1,441
1978–79	1,056,000	25,779	23,464	22,229	1,243	1,383	1,478

[c] *Projections of Educational Statistics to 1978–79*, U. S. Office of Education, p. 41.
[d] Projection 1 is an extrapolation of the linear regression for 1959–69 period.
[e] Projection 2 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1966–69.
[f] Projection 3 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1959–69.

Table B: Masters degrees in all fields, economics and agricultural economics by year, past and projected

Year	All Fields[a]	Economics[b]	Percent Economics	Agricultural Economics[b]	Percent Agricultural Economics
1959–60	74,497	708	.950	287	.385
1960–61	78,269	820	1.047	309	.394
1961–62	84,889	853	1.004	364	.428
1962–63	91,418	1,029	1.125	340	.371
1963–64	101,122	1,111	1.098	338	.334
1964–65	112,195	1,268	1.130	329	.293
1965–66	140,772	1,528	1.085	373	.264
1966–67	157,892	1,778	1.126	369	.233
1967–68	177,150	1,921	1.084	437	.246
1968–69	194,414	2,113	1.087	424	.218

[a] *A Fact Book on Higher Education*, 4th Issue, 1971, American Council on Education, Washington, D. C., P. 71.189.
[b] *Earned Degrees Conferred* Series, U. S. Office of Education (an annual publication).

Year	All Fields[c]	Projection 1 Economics[d]	Projection 2 Economics $(\bar{X}=1.097)$[e]	Projection 3 Economics $(\bar{X}=1.082)$[f]	Projection 1 Agricultural Economics[d]	Projection 2 Agricultural Economics $(\bar{X}=0.232)$[e]	Projection 3 Agricultural Economics $(\bar{X}=0.294)$[f]
1969–70	211,400	2,201	2,319	2,287	432	490	622
1970–71	244,300	2,362	2,680	2,643	445	567	718
1971–72	255,800	2,523	2,806	2,768	459	593	752
1972–73	270,700	2,685	2,970	2,929	473	628	796
1973–74	284,500	2,846	3,121	3,078	486	660	836
1974–75	301,700	3,008	3,310	3,264	500	700	887
1975–76	317,500	3,169	3,483	3,435	513	737	933
1976–77	336,100	3,330	3,687	3,636	527	780	988
1977–78	354,400	3,492	3,888	3,835	541	822	1,042
1978–79	368,400	3,653	4,041	3,986	554	855	1,083

[c] *Projections of Educational Statistics to 1978–79*, U. S. Office of Education, p. 41.
[d] Projection 1 is an extrapolation of the linear regression for 1959–69 period.
[e] Projection 2 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1966–69.
[f] Projection 3 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1959–69.

Table C: Doctorate degrees in all fields, economics and agricultural economics by year, past and projected

Year	All Fields[a]	Economics[b]	Percent Economics	Agricultural Economics[b]	Percent Agricultural Economics
1959–60	9,829	237	2.411	76	.773
1960–61	10,575	266	2.515	107	1.011
1961–62	11,622	268	2.305	111	.955
1962–63	12,822	331	2.581	103	.803
1963–64	14,490	385	2.657	115	.793
1964–65	16,467	410	2.490	128	.777
1965–66	18,239	458	2.511	128	.701
1966–67	20,621	546	2.647	134	.649
1967–68	23,091	600	2.598	152	.658
1968–69	26,189	634	2.421	187	.714

[a] *A Fact Book on Higher Education,* 4th Issue, 1971, American Council on Education, Washington, D. C., P. 71.789.
[b] *Earned Degrees Conferred* Series, U. S. Office of Education (an annual publication).

Year	All Fields[c]	Projection 1 Economics[d]	Projection 2 Economics ($\overline{X}=2.546$)[e]	Projection 3 Economics ($\overline{X}=2.522$)[f]	Projection 1 Agricultural Economics[d]	Projection 2 Agricultural Economics ($\overline{X}=0.676$)[e]	Projection 3 Agricultural Economics ($\overline{X}=0.756$)[f]
1969–70	29,000	670	738	731	175	196	219
1970–71	30,800	717	784	777	184	208	233
1971–72	33,200	764	845	837	193	224	251
1972–73	37,200	811	947	938	202	251	281
1973–74	43,100	857	1,097	1,087	211	291	326
1974–75	45,600	904	1,161	1,150	221	308	345
1975–76	48,700	951	1,240	1,228	230	329	368
1976–77	51,600	997	1,314	1,301	239	349	390
1977–78	55,000	1,044	1,400	1,387	248	372	416
1978–79	57,000	1,091	1,451	1,437	257	385	431

[c] *Projections of Educational Statistics to 1978–79,* U. S. Office of Education, p. 41.
[d] Projection 1 is an extrapolation of the linear regression for 1959–69 period.
[e] Projection 2 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1966–69.
[f] Projection 3 assumes that the ratio of economics degrees (or agricultural economics degrees) to all degrees is the same as it was for the period 1959–69.

Curriculum Development: Principles and Methods

RUSSELL P. KROPP

THE topic of this paper covers much territory. Brief space and limited personal ability make it prudent to attempt only to chart the terrain and to discuss just a few of its more prominent features. Hopefully, it will furnish a contextual frame within which to read and reflect less hurriedly at a later time.

Curriculum

Curriculum is an organized set of experiences to which learners are subjected so that their behavior will be modified in a desired and predetermined manner. According to this definition, curriculum is an instrument which is designed to change those to whom it is applied. A significant point is that a curriculum is not the result of fortuity; it does not merely happen. American history, European history, history of the Holy Roman Empire, history of the United States since 1865, and other typical offerings of a department of history do not constitute a curriculum as it is defined here. Our concern is with an organized set of experiences which hopefully will change learners who interact with it. Curriculum is not the current total of accumulated knowledge in a discipline.

This definition of curriculum has several components that deserve individual attention. These are the goals implied by the deliberate attempt to modify the learner's behavior; the choice of these experiences; and their organization. My remaining remarks are directed to these components and to some general observations.

Goals

The goals of curriculum are also commonly referred to as educational outcomes, educational objectives, and aims. It is tactically sensible to define the objectives in terms of behaviors which students should display who have successfully interacted with the curriculum. The student should be changed by the curriculum; his behavior at the end of the experience should be different from what it was at the outset.

The strategic advantage of defining goals in terms of student behavior centers on several points. First, it causes one to focus on learning, rather than on content or professorial needs. Second, it provides a means of determining who needs instruction and how much one gains from it. Third, it places at center stage what students do, rather than what professors do.

The inescapable and critical question which a curriculum developer must answer is what goals are to be served by the curriculum. The question is fundamentally important and there is no simple answer to it. I do not presume to know how you should answer. But I do know some items which you should take into account when grappling with it. These emerge in virtually every discussion of curricular goals. At one time or another, each arises, holds the stage for a short or long period, and is eventually dismissed or installed. It should be noted immediately that potential goals are not mutually exclusive or independent.

The discipline

Some claim that the goal of the curriculum is to teach the discipline. Advocates of this position are usually found in colleges of arts, letters, and sciences where undergraduate courses are regarded as the proper arena for proselytizing the young to the discipline.

The discipline admits to several definitions in practice. It is sometimes construed to be the totality of areas which concern the discipline, e.g., general psychology, educational psychology, child psychology, psychology of adolescence, abnormal psychology, sensory psychology, animal psychology, etc. The discipline might also be defined in terms of the assumptions on which it rests, the phenomena with which it deals, the terminology, the theory which describes lawful relationships among phenomena, and the method by which the theory is evaluated and extended.

As stated earlier, the curriculum as content or discipline is a common view. To a certain extent, it is an unexamined position. Usually it serves the needs of faculty far better than it does the needs of students.

Certification and vocational competencies

Setting the curricular goal as the achievement of employable skills has become increasingly common. It is a predominant goal in professional education of teachers, lawyers, dentists, physi-

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cians, and social workers. Establishment of land-grant colleges reinforced vocational competency as a plausible goal of programs of higher education.

The specific emphasis of this curricular goal depends largely on how competency is formally certified. This certification of public school teachers depends, mainly on having successfully completed prescribed courses of study. The certification of lawyers depends mainly on having successfully responded to the "bar examinations." In other vocations, e.g., economics, informal certification occurs when the former student wins and holds a job. Many subtle pressures in shaping curricular goals in the certificatory mold occur through the special accreditation programs of scholarly and professional associations.

Since higher education has been informally designated as the most prominent credential-granting institution in our society, one can expect that its curricula will continue to reflect heavily vocational emphases and to lack novelty in outcome. To remove the credential function from higher education could promote the establishment of alternative paths to achieving competency that might prove to be so popular as to threaten a substantial segment of higher education.

Tools for further learning

To attain the tools for securing additional knowledge is an accepted but not a widespread goal. The desired outcome is to arm the student with those instrumental skills that will enable him to be a continuing learner in the discipline or profession. This goal is quite related to the goal of mastering the discipline when that is construed to be mastery of the terminology, theory, and methodology.

The aim of developing continuing learners receives much reinforcement within colleges or universities. Graduate schools prefer students having this constellation of competencies. Many faculty prefer to train a student in this vein because it exalts his choice of career and provides him with an asexual means of reproducing himself to assure that the continuity of his work will not be interrupted.

Personal development

The curriculum can also be geared to foster the personal development of the learner in the sense that liberal education strives to achieve. The purpose here is to provide the learner with experiences which will enable him to understand himself better and to cope more meaningfully, in a nonvocational manner, with the reality with which he must interact. Through such training in economics he might become reflective about the inherent meaningfulness of work and whether free enterprise is better propagated by grants to governments or individuals in underdeveloped countries.

This objective of personal development generally gets short shrift in universities. It is usually catered to in basic division, liberal studies, or general studies courses which rarely attract the best disciplinary minds and which not infrequently are taught by partially qualified teaching assistants or by faculty who are more concerned about inducting people into the discipline than expanding the conceptual horizons of youth or providing youth with a value orientation.

To this point four kinds of goals of curriculum have been mentioned: mastery of the discipline, attainment of certification and vocational competence, acquisition of instrumental skills, and enhanced personal development. It was stated that these are the predominant kinds of goals and that some of them are mutually dependent. An unavoidable aspect of conscious curriculum development is the choice of goals. It is felt that most goals will fall within the four categories which were discussed.

A few final remarks about goal setting might be worthwhile. First, behavioral changes which signify goal achievement might be cognitive, affective, and psychomotor. Let us put aside psychomotor behaviors because of their limited applicability to most college curricula. Cognitive objectives are the ones which are more commonly established. They deal with such things as facts, skills, concepts, and principles. Affective objectives—attitudes and values—are rarely stated and, even when stated, assessing achievement of them is usually omitted. This is surprising on at least two counts. Attitudes and values are much more durable than facts and skills. Attitudes and values are often the predispositions that determine whether cognitive activity will occur in a given situation.

Second, a department might have several curricula existing side-by-side. One might serve liberal studies students, another might serve majors, and still another might serve as an area of support for a major being taken elsewhere.

Third, curricular goals which require primarily the acquisition of factual knowledge will probably serve students badly over the long term. The rate of production of knowledge is so great that old knowledge quickly grows obsolescent and new knowledge is so vast that it resists apprehension. The curriculum developer should remember that concepts and principles have a much greater survival value than do facts and skills. One study showed that only 20 percent of the factual knowledge of a course is retained during the year following the course, whereas knowledge of principles actually increases during the year following the course. In short, different kinds of learning have different survival values.

A final point is that relearning time should be taken into account in the setting of goals. Some critical information and skills are too complex or too infrequently used to be kept *in toto* in mind. With such materials, the objective should be to develop those behaviors which will enable the student to relearn the materials at a later time. All of us would probably be better off had much mathematics been taught to us with this in mind.

Choice of Experiences

Now let us consider how experiences are chosen for inclusion in the curriculum. You will note that the term "experience" is used instead of "content" even though the latter has traditionally been regarded as the stuff or substance of courses and curricula. Use of the word "content" is avoided because of unwarranted connotations it evokes. Content has come to be regarded as the essential attribute of a course. It is a "content course" and "he mastered the content" are examples of this specious attribution. It leads to the assignment of instructors to courses on the basis of their presumed content knowledge. It leads also to the formulation of courses which are merely packages of content having no bearing on intended student learning. All of this is regrettable. Focus should be on the behavior which learners should acquire. If one directs his attention to them and then asks what experiences can be devised so that exposure to them will cause the student to modify his behavior, he will immediately become aware that much of the content traditionally associated with a discipline would be equally useful in creating the desired experiences. If one wishes students to learn the relationship between the concepts of supply and demand, he can choose any of numerous traditional contents to serve as the vehicle of instruction. For the most part course content will soon be viewed as more or less interchangeable. When that occurs, one can focus without distraction on the behavioral objectives.

So, what matters are important when choosing the stuff from which learning experiences will be constructed? The following characteristics merit attention: cost, relevance, and accessibility.

Cost

A major factor in choosing the curricular experiences to which to expose learners is cost. Three types of cost are considered.

Instructor costs are those incurred by the instructor in arranging and administering learner experiences, counseling students, and evaluating learning products. The more extensive the instructor's participation, the greater the cost of instruction, other things being equal. Different teaching methodologies lead to substantially different inputs of faculty time and therefore instructor costs.

Learner costs are ascertained, although somewhat arbitrarily, by placing a dollar value on student time and then determining how many hours he must invest to attain a predetermined level of mastery. It should be mentioned that the relationship between learner costs and instructor costs for a given course of study has not been explored, but it is believed to be quite low.

Material costs include the costs of textbooks, manuals, audio-visual equipment, tests, test scoring, and physical space. These are often overlooked by curriculum developers.

Even though one can identify and categorize the various costs that characterize instruction, it is nevertheless difficult to make decisions on the basis of them because they are not sufficiently anchored to be dependable. Permit me to develop this thought. Collegiate instruction is generally time based, e.g., the instruction occurs for a fixed amount of time. In a time-based system, the amount of achievement is quite different from one learner to another. In a system of this kind, costs are therefore associated with highly different levels of individual achievement. In a sense the costs are not linked to a given level of output. It would be far more meaningful to know the aggregate cost of bringing a student having known characteristics to a predetermined level of achievement. Thus, when the attainment of mastery becomes the desired outcome, rather than time served, which characterizes most of our present instruction, one is more likely to regard the costs—instructor, student, and materials—as manipulable variables rather than fixed ones.

Relevance

Curriculum materials should be selected which are representative of the phenomena about which the discipline is concerned and which are likely to exist within the prior experience of learners or to evoke interests which learners already hold. Doing the former will inform the learner of the range of phenomena that the discipline attends to. Doing the latter will cause the material to be related to previous learnings of the student and/or to capture the motivational energy which he brings to the learning situation. It goes without saying that as the interests and prior learnings of students change, the content of the curriculum will have to change too, although the objectives of instruction might remain untouched.

Accessibility

Curriculum experiences should be chosen partially on their accessibility to students. The most accessible experience is, of course, that furnished by a single textbook or a lecturer, but neither is very useful in helping the student develop complex behaviors. These are more likely to be developed through planned exercises which require the student to integrate more elemental behaviors into more complex ones. To make such supportive learning environments accessible to the learner, the instructor must abstract them from life and present them as hypothetical situations into which learners are thrust. Exercises in a workbook are simple examples of this, and the old Link Trainer as a flight simulator is a more complex one. But now the curriculum developer is in a much more powerful position because he has electronic computers at his command. These are capable of simulating experiences in a way that is comprehensive, swift, and complex. Students are literally propelled into a make-believe world that has so many realistic qualities that the learner is swept up by the seeming realism of it.

Organization

The question of how one should organize learning experiences into a meaningful curriculum is considered here. Two general strategies are usually employed; for brevity, these might be called the linear and the spiral.

The linear curriculum is one that proceeds from the simple to the complex where the referent of difficulty is the complexity of the behavior which is sought from the learner. Usually the arrangement of experiences in this scheme will be increasingly complex, too, with respect to the conceptual structure of the content. With regard to the cognitive behaviors which learners show, early in the curriculum their behaviors will exhibit more recall, comprehension, and application. Later in the curriculum their behaviors should exhibit more analysis, synthesis, and evaluation.

The spiral method of curriculum organization proceeds somewhat as follows. A series of topics is treated cyclically. Each time one passes through the cycle, the cognitive behavior developed around each topic becomes increasingly complex Finer discriminations, more complex interrelationships of variables, and more of the conceptual structure are learned on each pass.

There are not many examples of these kinds of organizations to be found in college programs. This is so because collegiate departments, more so scholarly ones than professional ones, have conceived of their so-called curricula as the accumulation of knowledge in their fields. The mass of knowledge was broken into chunks, each having homogeneous elements, and these were called courses. Thus, the aggregate of courses is the curriculum and it is the total accumulation of knowledge. As new knowledge is added to the field, new courses must be added. This arrangement might be sensible to the scholar, but it is not oriented to or even helpful to the learner. Knowing all of history (i.e., taking all the history courses) does not necessarily help one to perform as a historian. The concern in curricula development should be the development of people with predetermined competencies; the concern should not be to cover the field.

Still another method of arranging curricula is being used in professional schools. It involves the treatment of increasingly complex or responsible topics, as does the linear method described above. But it also involves for each topic the combined effort of all disciplinarians and professionals who have a contribution to make to the synthesis which will produce the behavior the student is to learn. This method is clearly illustrated at some dental schools where instruction is geared to aspects of clinical practice. Each aspect is taught by a team of practitioners—anatomists, biochemists, neurologists, etc. An advantage of this method resides in focusing on clinical practice; it thereby avoids the need to learn separately the related disciplinary knowledge.

After one sequentially orders the materials in his curriculum, his next task is to decide whether it is teachable as is or whether it should be divided into smaller units. In higher education institutions, the latter choice is habitually made and in it, these small units are usually called courses and are given a title that corresponds to the predominant content.

It is precisely at this point that the greatest violence is done to curriculum. Courses, these expediently created subdivisions of the curriculum, take on lives independent of the curriculum and create serious misimpressions. First, each course takes on unitary qualities that make it relate progressively more poorly with the next subdivision of the curriculum. Second, professors and textbooks tend to provide unintended features that further destroy the sequentiality. Third, a student's progress is evaluated by noting his achievement of the objectives of the course; his overall achievement of the curriculum is determined by calculating his average achievement in the separate courses. His attainment of the overall objectives of the curriculum is not determined by noting his overall achievement of them; this critical fact is masked by the course organization. Fourth, another sacking of the curriculum occurs when students are permitted to choose those courses which will become their curriculum. Students then differ from one another with respect to what constituted their curriculum although an outsider would presume that all students have been similarly, if not identically, trained. In summary, the establishment of courses and the concentration on them tends to impair the curriculum.

In a way, it is the need for instructional convenience that brings down the curriculum. A promising new teaching methodology extends some hope of avoiding this pitfall. Individualized instruction provides a separate learning experience for each student. The content and the teaching method are cast into a single instructional package. The student can control the rate of presentation of content, and he can repeat sections of instruction as many times as he wishes. Another feature of individualized instruction is that the student must master one unit of instruction before he can proceed to the next. This enables one to posit increasingly complex objectives because the curriculum developer is assured that students will have mastered prerequisite learning materials before they attempt the next unit of instruction. Individualized instruction is significantly facilitated by employing technology, principally, audio-visual devices, videotape recorders and playback units, and on-line computers. Individualized instruction does not require the curriculum to be broken into courses, and thereby it mainly avoids the hazards of doing so. Two other conspicuous advantages of individualized instruction are these: it causes one to focus unrelentingly on the construction of learning experiences that lead to the attainment of desired objectives; and it causes professors to become designers of environments that will foster student learning, thereby diminishing the unwarranted attention given to teaching when learning is the real issue.

Observations

In closing, two observations will be made that are related to curriculum but are not quite central to the major topic.

First, unless departmental administration is firm and vigilant, courses will multiply as rapidly as do rabbits. When this occurs, the department will find itself teaching courses rather than the curriculum; it will find itself needing to employ additional faculty to teach courses that otherwise would not be taught; and research and service will decline because teaching loads spiral. But analyses will reveal the following: many of the courses really have little to do with the curriculum; enrollment in each course is small with the consequence that overall productivity is constant although teaching time is increased; and finally, instructional costs are increased. This situation characterizes a distressingly large number of departments. There are four major safeguards. First, define curriculum as a body of experience and retain only courses that are subsets of it. Second, after paring down the list of course offerings, adopt a rule stipulating that an old course must be dropped if a new one is to be added. Third, if a special course must be installed to accommodate the need or vanity of a professor, make its life coterminus with his tenure so that it is dropped when he leaves. Fourth, realize that there is no reason for believing that all knowledge in a discipline or profession should be captured in courses.

My other closing remark is that egalitarianism will radically affect the functioning of departments which traditionally have served elitist populations. One point of particular impact will be the curriculum which is probably paced for an audience more advanced than ones which might present themselves subsequently. A pattern of instruction which is fixed-time in format will serve new learners poorly. An individualized format should be adopted which puts learning under the control of the student and enables him—or more accurately, requires—him to spend as much time as he needs to attain mastery and without running afoul of regulations on instructional cycles. Prudence would appear to dictate the establishment of this method of packaging curriculum and giving instruction about it.

Guidelines for Curriculum Changes in Agricultural Economics*

LESTER V. MANDERSCHEID

THE purpose of this paper is to provide a basis for the more specific and detailed curricular discussions expected in the following sessions. The paper includes a brief review of the definition of a curriculum, a historical and international perspective on curricular discussions in agricultural economics, and a review of the work of the Commission on Education in Agriculture and National Resources and concludes with some themes and hypotheses that may serve as a springboard for discussion.

Definition of Curriculum

Before beginning a discussion of curricular guidelines, it may be useful to pause for a moment to consider the concept of curriculum itself. The original Latin meaning of curriculum was "a running course or race course, especially a chariot race course." The word passed into French as a verb meaning "to run." Thus, if one combines the French and Latin meanings, one deduces that curriculum means "to run a race course with or without a chariot" [3, pp. 2–3]. Some students suggest that some of us design curricula as if we were designing a race course.

Others explicitly or implicitly use quite different definitions. For example, Plato's Dialogues scarcely mentions schools. Education is identified with all the influences that mold the mind and character of the young; music, architecture, drama, painting, poetry, law, and athletics. The defintion used during the 1930's, and included in the *Encyclopedia of Educational Research of 1960* [4], was "all the experiences a learner has under the guidance of the school." This definition differs from Plato's only in that Plato did not identify education with a school. King and Brownell define curriculum as "a planned series of dialogues among teachers and students" [8, pp. 2–3]. In 1965 McDonald defined curriculum as "the system of planned actions for instruction" [4].

Each of these definitions serves a useful purpose. Plato reminds us that a school is not necessary for an education, while the definition from the 1930's indicates that schools have become society's major means of education. King and Brownell [8] identify the importance of both teacher and student—both instruction and learning—but perhaps are too narrow in restricting the curriculum to those learning experiences where dialogue actually occurs. McDonald indicates the usefulness of a *systematic* approach and restricts the curriculum to those *planned* instructional activities which implicitly recognize the existence of unplanned learning experiences. Thus, I take as a point of departure that a curriculum is a system of planned instructional experiences for students, designed by faculty, to enhance students' learning processes. By planned instructional experiences, I mean courses plus all other activities designed by the faculty for the purpose of enhancing students' learning. Implicit in the definition is specification of a goal toward which the system is planned. Goals for curricula in agricultural economics could well be a topic for a major paper in their own right.[1]

A Perspective

Curricular issues were not recently discovered by the profession, despite the three national workshops on curricula held during the 1960's. H. C. Taylor [15] recounts in *The Story of Agricultural Economics* some of the early disputes of our profession between those who argued that agricultural economics was based in practical applied biology and those who argued for a base in economic principles. On November 4, 1910, after the establishment of the American Farm Management Association, H. C. Taylor wrote to Dean H. L. Russell as follows:

> I wish to call your attention to the desirability of having a committee appointed at the next meeting of the American Association of Agricultural Colleges and Experiment Stations to present a report of terminology, lines of cleavage, and content of courses which should be made use of in that line of work which relates to the economic aspects of the production and marketing of agricultural products.
>
> During the last few years courses have multiplied in this field. The terminology varies so greatly that a man in one of the agri-

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* The assistance of James Bonnen, Larry Connor, and John Shields is greatly appreciated.

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[1] For a discussion of goals for agricultural economics curricula see the papers presented at the Blacksburg symposium, *Am. J. Agr. Econ.* 49, No. 1, Part II, Feb. 1967.

> cultural colleges talking to a man in another agricultural college has to explain what he means by his phrases before the two can understand each other. The phrases rural economy, rural economics, agricultural economics, farm management, farm administration, farm organization, and economics of farm management are all often used to designate the same kind of work. It is also true that the usage in many of the agricultural colleges of the United States is clearly out of harmony with the usage in those European countries where this field has been well developed. I think it highly desirable, therefore, that a committee be appointed with a view of clearing up some of the fog that still hovers about this new field. [15, p. 89]

As a result, the matter was referred to the Committee on Instruction in Agriculture which appointed a subcommittee on Rural Economics and Farm Management. The subcommittee report is printed in USDA Experiment Station Circular 115; some appropriate passages include:

> With regard to the fifth branch of study, it seems desirable to use the term rural economics as applicable to the general field of economics in its relation to agriculture and rural communities....
>
> Rural economics is preferable to agricultural economics because the former term indicates that the affairs of the community, as well as of the individual farmer, are to be considered under this head....
>
> Your committee is deeply impressed with the importance of developing strong courses in rural economics and sociology and the other subjects just referred to. These all involve the human element in agriculture above the materialistic plane, to emphasize broadly the human interest that properly inheres in agricultural studies, and thus to inspire both faculties and students in our agricultural colleges with a higher sense of the wide responsibilities attaching to leadership in agricultural affairs. Pedagogically they serve to show that agriculture when broadly treated, is to be enrolled among the humanities, as well as the sciences; ethically, they point out the vital connection between agricultural science and the welfare of rural people and even of all mankind. [20, pp. 12–14]

Taylor remarks that while this report brought neither immediate harmony nor common point of view, it did prevent further cleavage between the several factions within the emerging profession. Furthermore, the quick acceptance of this report by the administrators both within the USDA and the colleges meant that the report was of vital importance in giving direction and emphasis to the profession.

A review of our professional journals (*JFE* and *AJAE*) for articles primarily concerned with curricular questions yields the following results:

Decade	*Number of Citations*
1920–29	8
1930–39	5
1940–49	18
1950–59	19
1960–69	33

A review of some of these articles indicates that many "current" issues are not really new. A few examples may illustrate this point. In 1927 O. G. Lloyd [9] discussed the concerns about decreased enrollments in agriculture. In 1928 G. F. Warren [23] discussed how the agriculture student should be introduced to agricultural economics. In 1921 W. E. Grimes [6] reported from the Committee on Teaching with respect to outline and content of courses and efforts to standardize course content and titles. A series of discussions about the role of mathematics led J. M. Thompson [16] to stress the importance of increased training in mathematics and statistics in a 1937 article. In 1923 W. D. Nicholls [11] was already discussing proper preparation for graduate work.

Nor are these concerns limited to the United States. Professor H. T. Williams [24] used as his topic "An Approach to University Teaching in Agricultural Economics" when he delivered his 1971 Presidential Address to the Agricultural Economics Society (United Kingdom). Professor Williams' major theme was that "the aim of teaching in Agricultural Economics is to present a variety of subject matter within the framework of cohesive degree structures consistent with an academic discipline, while as far as possible fitting a student for a professional career in the fields of agricultural economics." Much of the discussion around the address indicated that the conflict is between those who emphasize preparation for practicing agricultural economics and those who emphasize the discipline of agricultural economics. A common comment about university preparation was that it produced a disciplinarian with a taste for academic equivocation rather than a decision-oriented businessman [24].

The April 1970 issue of the *International Jour-*

nal of Agrarian Affairs [12] was devoted to training in agricultural economics. In that issue there is discussion of programs in Sweden, Italy (Naples), Latin America, and South America. Throughout one finds discussion of issues current to the curricular discussions in the United States. For example, the new doctorate in Sweden proposes a requirement of 10 lecture hours of teaching to demonstrate the candidate's oral ability and ability to teach undergraduates. Another example concerns the sections on the market for graduates found in the paper by Valdés and Dillon [22] considering appropriate curricula for South American farm management programs and the paper by Witt and Pellegrini [25] considering graduate programs in Latin America.

Many current curricular problems are common across both time and place. The review provides evidence that many have sought a solution to the problem of an ideal curriculum and failed. In spite of their failures, we have a growing, dynamic profession. Perhaps this perspective will help us place current discussions into a context that views a curriculum as an evolving dynamic process requiring constant attention to factors such as:

(1) Change in the mix of students entering the curriculum—both with respect to their formal and their informal educational experiences and their changing goals and aspirations.
(2) Change in the profession and discipline of agricultural economics which, because of its problem-solving orientation, changes with the changing nature of both problems of society and changes in the various disciplines upon which the problem solving is based.
(3) Nature of the educational institution in which the curriculum is lodged. Educational institutions differ with respect to educational objectives; student ability, diversity and motivation; faculty objectives; and areas of academic excellence.

One reason why curricular discussions are so long and heated is probably captured in a humorous but serious definition of curriculum by Arnold Towe:

> Curriculum is the most sophisticated non-zero-sum game ever invented. It takes an average of 4 years per game from the life of each player, and is so expensive that entire populations are taxed for its support. . . . The game is deceptively simple. Each player maneuvers through the interstices of a ponderous framework, called the curriculum, attempting to optimize simultaneously three factors, each under its own independent rules. Courses are taken in any of a variety of sequences and distributions. Credits are obtained at some rate until a particular sum and distribution among categories is attained, and grades are acquired in a five-bin, four-point system. Any player maintaining a four-point grade average while simultaneously satisfying all course and credit requirements is declared an 'instant winner'; other players also may 'win,' albeit in a less spectacular manner. A group of advisors is usually provided to aid each player on his tour through the intricacies of the game and to inform him of special options and how to exercise them. Through the latter vehicle, many subtleties are introduced.
>
> The current fad is to see how much change can be made in the internal structure of the game without altering its basic framework and operating rules. [17]

Commission on Education in Agriculture and Natural Resources

During the decade of the 1960's, much attention was given to undergraduate curricula in agriculture and natural resources by the Commission on Education in Agriculture and Natural Resources (CEANAR) which was funded largely through the National Academy of Sciences and the National Science Foundation. Table 1 contains a core curriculum recommended by CEANAR for students in agriculture and natural resources.

As a basis for comparison, we might use the survey of undergraduate curricular patterns conducted by HEW and covering the academic year 1962–63. These data, while out of date, may furnish a basis for comparison (see Table 2).[2]

A precise comparison of the two tables is complicated by the large difference in elective credits that may be used in a variety of different ways. But a brief comparison of these tables indicates that the CEANAR-recommended curriculum includes more mathematics, physics, biology, and chemistry than was included in the typical agricultural economics or agricultural business curriculum of the 1960's. The typical curriculum in agriculture included as many credit hours in the natural sciences as the recommended curriculum, but a detailed review indicates the content differed markedly—especially in mathematics and biology. The recommended curriculum includes more total social science and humanities credits than is included in the typical agricultural curriculum of 1962–63. The other differences are in detail rather than in the broad allocation of credits.

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[2] A survey of current programs in agricultural economics departments is now being conducted by the Education Committee of the American Agricultural Economics Association.

Before arriving at its recommendations, the CEANAR cooperated in several studies of particular parts of the curriculum for students in agriculture and natural resources. Areas studied include the biological sciences, physics, chemistry, mathematics, and the social sciences. In each case, the study team involved both faculty from agriculture or natural resources and faculty from the basic disciplines.

One general finding that emerged from these specific studies is seldom found explicitly in the reports. It is the finding that the faculty from colleges of agriculture and natural resources were often out of touch with recent developments in the basic disciplines from which they had been drawing courses for their students. In many cases, those from the basic disciplines were equally unaware of changes taking place in agriculture. Thus, even though these educators were selected because of their strong interest in curriculum development, it was necessary to conduct considerable dialogue with respect to the changing nature of agriculture and natural resources on the one hand, and the basic discipline on the other, before real communication took place. Faculty from colleges of agriculture often viewed the basic discipline in terms of courses they had completed in that basic discipline 15 to 35 years ago.

The first of the joint studies involved the biological sciences. There has been a great shift of emphasis in the biological sciences from an organismic approach emphasizing taxonomy to a cellular or molecular approach emphasizing biochemistry. On many campuses introductory courses in botany, zoology, microbiology, and entomology have been eliminated in favor of an introductory sequence in basic biology. In 1965 and 1966 when these studies took place, many biologists were concerned about the opposition to the modernized biology courses from faculty in agriculture and other applied disciplines. The biologists hoped that by cooperating with CEANAR they could develop biology courses acceptable to both the modern biologist and the faculty in agriculture who require biology in the curriculum. Out of the study came general agreement that the integrated biology approach was supe-

Table 1. Recommended curriculum for students in agriculture and natural resources[a]

Core	Semester credits	Courses
English, speech, communications	12	4
Principles of economics and business	6	2
Chemistry (including introductions to organic chemistry and biochemistry)	10	2
Mathematics and physics[b]	15–18	4–6
Biology	8	2
Humanities and social sciences (other than principles of economics and agricultural economics)	18	6
Professional agriculture	24	6–8
Subtotal	85–88	
Elective (not more than 20 credits in professional agriculture courses)	42–45	
Total (approximate)	130	

[a] Source: [10, p. 165].

[b] To include elementary analysis, elementary calculus, elementary statistics and probability, and elementary computer science. Traditional courses in these areas must be restructured to come within 15 credits.

Table 2. Distribution of student credit hours among subject matter areas—by majors, 1962–1963[a]

Subject Area	Agr. econ.		Agr. business		Ave. agr.	
	Semester credits	Percent	Semester credits	Percent	Semester credits	Percent
Natural sciences and mathematics	27	(21)	23	(18)	35	(27)
Social sciences	26	(20)	27	(21)	16	(12)
Humanities	13	(10)	13	(10)	13	(10)
Agriculture	31	(24)	35	(27)	39	(30)
Physical ed. and R.O.T.C.	5	(4)	4	(3)	5	(4)
Other	1	(1)	1	(1)	1	(1)
Electives	26	(20)	26	(20)	21	(16)
Total	129	(100)	129	(100)	130	(100)

Curriculum Area spans Agr. econ., Agr. business and Ave. agr.

[a] Source: [21, pp. 15–16].

rior to the separatist approach of the several disciplines; however, there still remained a number of areas of disagreement. Disagreement ranged from the amount of biology that should be required through the level and type of needed prerequisites to the importance of laboratories. Faculty from agricultural fields that rely heavily on biology were willing to accept a two-year core of integrated biology. On the other hand, those from the social science and physical science fields argued that a year of biological science was the absolute maximum that could be incorporated in a four-year undergraduate curriculum for their students. Those with a biological or physical science orientation were more willing to require chemistry as a prerequisite or a corequisite. Similarly, the more biologically oriented faculty argued for the importance of laboratory techniques in basic biology so that the techniques would be available for advanced courses in agriculture. The social sciences panel argued that laboratories emphasizing techniques were a waste of time for their students because the techniques were not used outside the biology classes. It should be noted that the argument against laboratories focused on the technique emphasis and not on the laboratory designed for helping the student learn basic biological principles [18].

As the preceding paragraph demonstrates, the study of the biological science area affirmed the need for a systems approach to curriculum development because it soon became clear that one cannot discuss biology in isolation from the rest of the curriculum. This led to the decision of CEANAR to cooperate in studies in the chemistry, physics, mathematics and social science areas.

The Committee on Chemistry recommended two-year-long courses. The first would be required of all students in agriculture and natural resources while the second would be available for those with more need for chemistry. The Committee indicated that only a few areas in agriculture and natural resources, agricultural economics being the only one specifically named, should be permitted to omit the second course from the curriculum. The course for the first year represented an integrated treatment of physical, organic, analytical, and inorganic chemistry. The second course was a continuation of the organic, biochemical, and analytical components of the first course [19, pp. 22–26].

The Committee on Mathematics put particular stress on the need to consider the changing mathematics program in the high schools and suggested that colleges of agriculture require four years of college preparatory mathematics as an entrance requirement [19, pp. 27–40]. They suggested that this requirement be introduced in stages over a five-year period. Recommended mathematics courses for students in agriculture and natural resources are shown in Table 3.

Students in agricultural economics and agricultural business were included in the science category on the table. Many are familiar with the publication, *A General Curriculum in Mathematics for Colleges* [5], published by the Committee on the Undergraduate Program (CUPM) in Mathematics. The first six courses listed in the table can be identified as CUPM courses. Thus the Committee on Mathematics recommended that undergraduates complete six semesters of mathematics and statistics which would carry them through three semesters of calculus, a full year of statistics, and a semester of linear algebra. In addition, they proposed a one credit course entitled "Principles of Programming," designed to acquaint students with the basic features of computer hardware and software and to introduce programming languages and techniques.

The Committee on Physics recognized the same changes taking place in high school mathematics instruction. Instead of urging that this mathematics instruction be used to provide students an opportunity to advance further in college mathematics, the Committee on Physics argued for increasing the physics content of the curriculum, hardly a surprising recommendation from a group oriented toward physics. They recommended a two-semester course as appropriate for most agriculture curricula and suggested it be omitted only from those curricula in which students are not obliged to develop mathematical skills. The Committee on Physics did not provide a detailed outline of the course but did suggest that the text be oriented to agriculture, not merely by injecting farmyard examples, but by a

Table 3. Recommended mathematics courses for students in agriculture and natural resources[a]

Course	Semester hours	Education	Technology	Science
Introductory calculus	3–4	X[b]	X	X
Multivariable calculus	3–4	—	X	X
Probability	3	X	X	X
Linear algebra	3–4	—	—	X
Theory and techniques of calculus	3–4	—	—	X
Statistical inference	3	—	X	X
Introduction to computing	3–4	X	X	—
Principles of programming	1	—	—	X
Semester hours		9–11	15–18	19–22

[a] Source [19, p. 33]
[b] X - recommended.

careful attempt to identify those concepts in physics most useful to graduates in agriculture and natural resources and by illustrating those concepts with actual data from the applied areas [19, pp. 41–44].

The Committee on Social Sciences recommended that 15 to 20 percent of the curriculum (20 to 24 semester credits) be devoted to the social sciences. They recommended that students gain a depth of understanding in two social science disciplines. Economics was recommended as one of the two disciplines that all students in agriculture and natural resources should study in depth. The second discipline would be selected after considering the student's major and interests as well as the quality of available courses. Some general recommendations were made for relevant courses for majors in various areas. The Committee concluded by noting that a long-range solution to curriculum development would require greater interaction between faculties in social sciences and agriculture and natural resources. Out of this interaction would come both a more relevant set of social science teaching materials and a greater understanding of the value of the social sciences in solving the problems faced by rural society [14].

The work of the Commission on Education in Agriculture and Natural Resources has contributed greatly to recent curricular discussions. It did, however, neglect the vital and important area of the humanities. The neglect may be understandable in view of the source of CEANAR funding, but it is a neglect that is especially critical to agricultural economists because social science research and teaching constantly interfaces with the humanities as well as the natural sciences. To social scientists the importance of values and humanistic concepts is obvious—we constantly embrace ideas such as freedom, justice, equity, and equality, and these concepts were never more evident than in current discussions of pollution control, need for new technology, rural development, and the future structure of agriculture.

Neglect of the humanities is critical from another perspective—that of tools needed by a student to learn and to continue to learn. Here I find the work of Daniel Bell [2] useful. He characterizes learning in the natural sciences as *sequential,* that one must proceed from level to level through a clearly defined pattern of prerequisites. Within the social sciences, the pattern is one of *linkages* between fields—e.g., elements of economic policy are understood fully only in a political context which, in turn, requires a conception of the social community. In contrast, knowledge in the humanities tends to be *concentric* with many concepts requiring the student to proceed through a series of circles of meaning in an effort to attain understanding of a text or experience [2, p. 174]. Whether or not one accepts Bell's approach, most educators woud agree that the humanistic approach is a different and useful approach to knowledge.

In addition to neglect of the humanities, the several studies failed to consider the trade-offs required to produce a total four-year undergraduate curriculum. The task was performed by CEANAR and the results are reproduced as Table 1.

Recurring Themes—Some Guidelines

The purposes of this section are to develop several recurring themes that may be useful guidelines in the process of curricular development and to suggest a few hypotheses regarding curricular substance. These themes and hypotheses emerge from my analysis of the preceding material as well as from a general knowledge of agricultural economics curricula.

Probably the most common theme running throughout the discussions is the need to update the curriculum to reflect current and prospective changes in agriculture and in our discipline. This theme is evident in the 1910 controversy cited by H. C. Taylor and persists through the work of CEANAR in the 1960's.

An important implication of this theme is the need to educate for change. The theme recognizes that not only is the world of work that today's graduates enter different from the world of work into which we entered, but the world of work from which our graduates will retire is quite different from that into which they will enter. The challenge is to include in the curriculum both a recognition of the need for lifelong education and the basis for that education.

However, a danger in pursuing the theme of the changing nature of the profession is that the curriculum reflects the current fad rather than the core of the profession. The danger appears most frequently at the graduate level where a review of the emphasis on specific quantitative techniques may illustrate such a tendency. It seems as if at one time everyone studied linear programming, at another time everyone studied simultaneous equations techniques, at another time everyone studied production functions, and so it went.

A second theme relates to the need to keep up with the changing disciplines in supporting and complementary areas. It is not sufficient to say to students that we took beginning botany and zoology, therefore you should take it. We rather need to ask what the biological sciences have to offer a student in agricultural economics. Then we need to work with biologists to develop an educational package that optimizes the relationship between usefulness for students and budgetary costs to the biological science departments in an era when program budgeting and cost effectiveness increasingly affect university curricular decisions.

The third theme concerns local orientation of the curriculum. The discussions emerging from the CEANAR consistently pointed to the importance of developing a curriculum relevant to the particular students in the particular institution. This is in sharp contrast to the discussions in the early part of this century when there was emphasis on developing national standards for courses in agriculture. Recent emphasis on local orientation reflects the convergence of several forces. First is the recognition that there are significant differences in the types of students that select different colleges and even among students selecting different majors within a particular college [13]. Recognition of these differences provides strong evidence for modifying any national guideline to fit the local situation.

There is another important aspect to the need for local orientation—differences in comparative strengths of the various disciplines at different institutions. If we define curricular content in broad terms, as did the Committee on Social Science [14], we may be able to use courses from any of several disciplines or departments. Then by choosing courses from the strong departments with the best faculty, we may gain both better content and better instruction.

An implication of this theme is that agricultural economists may need to demand strengthening of departments needed for a strong agricultural economics curriculum. This need is probably greatest with respect to the humanities. As noted above, a USDA Circular published in 1912 [20] stated that agriculture, when broadly defined, could be considered part of the humanities as well as the sciences. Agricultural economists, as applied social scientists, have the responsibility within the colleges of agriculture to lead the way in developing relationships with the humanities, especially with respect to curricular matters but also in research.

These themes lead to a final theme of integrating the curriculum into a curricular whole, by a carefully considered discussion of the total curriculum by all of those involved both within agricultural economics and outside it. The theme reflects the comments made earlier of drawing on the strengths of the local situation, recognizing the changes in the other disciplines, and helping other disciplines to recognize the changes taking place in our field. And it refers back to the definition of curriculum as a system of planned instructional activities.

The previous themes have emphasized the dynamic nature of curricular development as a process. But the process must ultimately lead for each student in each institution to a particular set of courses and other learning experiences. The themes presented above indicate my belief that a national curriculum would be a mistake.

However, as a starting point for discussion, I offer four hypotheses on the weaknesses of current agricultural economics curricula in the U. S. First, for reasons cited above, the humanities component is usually insufficient in the curriculum. Second, our curricula are better developed with respect to serving those preparing for careers in the private sector of the economy than for those entering the public sector. Yet the latter is rapidly expanding and providing an increasing number of opportunities for applied social scientists concerned with rural problems. Third, curricula are not integrated into a curricular whole but instead are often an agglomeration of courses with the student expected to find the connections among the component subsystems. Fourth, courses and curricula are often based on teaching objectives rather than learning objectives; in other words, the curriculum often reflects more what the faculty want to teach than what the student needs to learn. These hypotheses regarding substance may not hold true in any particular setting. Indeed they are not stated in testable form. However, it is my impression that these hypotheses point to some of the current weaknesses in agricultural economics curricula and may be useful in starting a discussion of what needs improvement.

Concluding Remarks

A series of themes and hypotheses has been suggested in this paper. The themes in brief form are the following:

(1) Curricular development is a dynamic process reflecting the changes in students, societal problems and the discipline.
(2) Curricular development requires effort to

monitor developments in supporting and complementing disciplines.
(3) Curricular development must be localized to the particular institutional setting.
(4) Curricular development requires integration of all the planned instructional activities into a systematic whole.

In brief form with respect to curricular substance, the hypotheses are as follows:

(1) The humanities deserve increased attention.
(2) Preparation for careers in the public sector deserves increased attention.
(3) Curricula reflect inadequate attention to integration.
(4) Curricula are often based on teaching rather than learning objectives.

In designing a system of planned instructional activities, we operate as economists and managers. We identify our desired output—our goals for the graduate. We identify the raw material, the students who enter our curricula. We add as variable inputs a series of planned instructional activities. We combine these inputs to maximize the marginal product, learning measured in terms of our goals, given the cost and quality of inputs in our institution. Our job is complex because we do not have well defined output prices (in terms of either career earnings or career contributions to society) nor well defined production functions. Complexity is, however, only a challenge. As curriculum managers we must constantly strive to understand the process better so that we can improve our product—the learning embodied in the graduate.

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New Directions in Agricultural Economics Curricula, University of California, Davis

EDITH HALL PARKER

THE entire College of Agricultural and Environmental Sciences at the University of California, Davis, has been challenged to find and implement innovative educational programs by the 1970 "New Directions" report on undergraduate teaching in the College. Recommendations were gathered from a year of study by three committees charged by former Dean C. O. McCorkle with considering goals, curricula, and majors, and the administration of teaching programs. The new direction in administration was quickly effected by creating five interdisciplinary teaching divisions so that the needs and objectives of the various undergraduate teaching units could be considered independently of departmental research missions. (The five undergraduate teaching divisions are Agricultural Sciences, Biological Sciences, Food and Consumer Sciences, Resource Sciences, and Applied Economics and Behavioral Sciences, the latter consisting of three majors with primary emphasis on agricultural economics and four in the area of applied behavioral science).

Stressing the need for curricular flexibility both to meet the unique objectives of individual students at each point in time and to provide for systematic adaptability over time, seven reforms proposed by the study committee have been instituted. The first four measures affect all undergraduates in the College: (1) increased emphasis has been placed on the dual role of faculty advisors in assisting each student to obtain her personal educational objectives and in seeking student input into changing curricula; (2) all college-wide "breadth" requirements have been dropped; (3) students may take up to one-third of their total units on a pass-no record basis ($P \geq C-$) with no restriction on so taking major courses; (4) course prerequisites have been eliminated or replaced wherever possible with "recommended bodies of knowledge." In addition, individual students may elect to take "courses of inquiry"—problem solving courses whose specific content is determined by a student or students and one or more faculty with a common interest. Likewise, the Explorer program permits an individual student, in consultation with an advisor, to tailor an individual major by describing his special educational objectives and proposing a study list to accomplish them. Finally, the existing majors have been requested to substitute broad areas of knowledge for specific requirements (e.g., 10 units of natural science in lieu of requiring Physics 1 and Chemistry 5).

The new direction in goals of the College's undergraduate teaching program stresses the involvement of students in both determining educational policy and in evaluating the teaching and advising output of the faculty. The purpose of this involvement is to obtain more information about students' demand for the educational product instead of our traditional reliance upon whatever course structure and content faculty have chosen to supply. In agricultural economics, substantive changes in both the undergraduate and graduate curricula reflect the recommended "new directions" for increased flexibility. Our undergraduate program offers the traditional choice between majoring in agricultural economics or business management (with about 60 declared students in each). In addition, however, we have another 10 students in either the Exploratory program or our new development, resource, and consumer economics curriculum, which offers a choice of four subspecializations, as shown in the program outlines which follow. (This new major is designed to attract the undergraduate interested in policy and planning in the public sector.) Surveys of recent graduates as well as current undergraduates in the Department show that the problem solving orientation of our courses is a strong feature of our program, one we certainly seek to maintain. Increased freedom of choice even in major requirements has led to several courses being dropped for insufficient demand, while the small course of inquiry format allows us now to test-market new products and get quick student feedback as new areas of interest evolve.

Increased flexibility has also been incorporated into the graduate program. Candidates for the M.S. in managerial economics may choose 30 units of course work and a thesis or 36 units of course work; both programs require a comprehensive examination, which may be either written or oral. A full-time student with good under-

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graduate preparation can complete the course requirements in three quarters. Both master's and doctoral students may take up to one-third of their course work on a satisfactory-unsatisfactory grading basis (in lieu of letter grades), and approximately the same proportion of courses are taken in elective fields, as shown in the sample programs below.

All Ph.D. students must satisfy six fields by written exams or grade of "B" or better on specified courses (two elective fields of eight units each, micro and macroeconomic theory, agricultural economics research, and quantitative methods and statistics) and submit a field research essay prior to filing for the oral candidacy exam. There are presently 13 approved elective fields from courses offered in economics or agricultural economics, and the graduate students are seeking approval of complementary fields in other departments. Information on future curriculum needs is being gathered from a survey of agribusiness employers and is supplemented by two graduate students who serve on the committees supervising graduate course work and research.

Sample curricula are briefly outlined below.

A. The undergraduate curricula offers three majors in agricultural economics, business management, and development, resource and consumer economics with the following common requirements:

   1. Preparatory requirements—39 units, including a minimum of nine in math.
   2. Breadth requirements—32 units, a minimum of eight units each in the three areas of agriculture, natural science, and social science.
   3. Concentration requirements—22 units in intermediate theory, intermediate statistics, and senior research.
   4. Specialization requirements of 20–25 units differ as the business majors select at least 25 units from the 50 available in that area, the development, resource and consumer economics majors concentrate on policy oriented courses in either development, natural resource, human resource, or consumer economics, and the agricultural economics majors choose at will (from economics or agricultural economics) after completing additional requirements in calculus and micro and macro theory.

B. The Master of Science in managerial economics is most often satisfied by 36 hours of course work in the following areas:

Field	*Quarter Units*
Microeconomic theory	4
Research Methods and Quantitative Analysis	12
Production and Marketing Management	9
Electives (thesis may count as 6 units)	11
	36

C. The Ph.D. program requires 65–70 units of course work in six clearly defined areas, a field research paper, oral comprehensive and dissertation. All students must pass written "prelims" in microeconomic theory and quantitative methods. Fields in agricultural economics research and macro are also universally required, but may be satisfied by a grade above B – on specified courses in these areas. The two required elective fields may be chosen from among the following thirteen areas: economic history, economic development, international trade, labor economics, economic systems, industrial organization, public finance, money and banking, agricultural and resource policy, operations research, econometrics, consumer economics, and managerial economics.

SIU's Curriculum in Agricultural Economics

WALTER J. WILLS

IN building curricula a number of factors provide limits as to what can be done. A program must be built to meet the needs of the students within the capabilities of the staff. The university prescribes certain requirements such as general education and grade point. The school prescribes certain other parameters.

The goal of our teaching is to provide the student with (1) the background information so he knows what questions need to be answered to solve the problem, (2) what information is needed to answer the questions, (3) where to find the information, and (4) how to interpret the information. It might be well if everyone in teaching were to evaluate critically how their courses measure up to these criteria.

The primary goal of examinations is to determine if the teacher is meeting the above criteria and if he is making the points he thinks he is. Secondarily, the examination permits the teacher to determine if the student understands the important topics covered, thus providing a basis for a grade.

One of the first considerations is a look at the source of students. Over half of our students are transfers from community colleges, so we have only two years to complete their programs. This implies developing a working relationship with the community colleges to encourage attendance at these institutions and to minimize time lost in the process.

There is also a need to know where our graduates (B.S. and M.S.) find employment (industry, government, education, graduate school, or farming). Shifts in employment should be analyzed frequently to obtain a first approximation as to what courses the curriculum should contain. Course content needs regular systematic review to be assured that the essentials are included. There is also a need to follow up graduates systematically and to talk with employers and prospective employers to determine strengths and weaknesses of students and how these might be corrected.

When there is limited staff and the university is very cost conscious, as most universities now are, much more attention is paid to credit hours generated which becomes a function of class size. This has further implications because in many courses non-majors may outnumber majors. This may be true in a large number of undergraduate courses. Increasingly, we may be happy to have these non-majors in our classes. In addition, if we teach only for our majors, we may find other departments taking over these service functions, and their knowledge and background may shortchange their students. We recognize this service function as a major departmental responsibility.

Probably every teacher needs to look at his material to determine how much and what is needed to understand the subject and to permit the student to use this information to achieve his professional goals, and how much of the material presented is to satisfy the professional ego of the teacher

There is not unanimity of opinion as to the amount of technical agriculture a student should have; but for many employment opportunities he must have some minimum level of technical agriculture. For other job opportunities he may also need either a farm background or farm experience. Answers to these questions become an important part of decision making which is at the heart of agricultural economics. Most management, at least at the early levels for graduates, involves devoting as much if not more time to implementation of decisions than to making decisions. If decisions are made, these often involve technical information. Implementation frequently involves technical information and working with people.

There are those who feel that management is management, that business management and farm management are interchangeable. At Southern Illinois University we have taken the approach that farm management is different. Partly because of our service responsibility to other majors in the School of Agriculture, but also because we recognize that farm firms are different and will be for some time, we feel there is a particular need for farm management. Agriculture business management may also be different from the traditional business management approach; we think a course should be offered, but there are

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some budget restraints forcing us to consider a number of alternatives.

This discussion emphasizes the need for frequent reevaluation of courses and course content not only within the department but also in the School of Agriculture and in other schools and colleges, especially the School of Business (economics, marketing, accounting and administrative sciences). Frequently we are able to negotiate changes that more nearly meet our requirements.

The parameters discussed indicate the need for a flexible program that meets the students' needs and those of the employers. Such a flexible program places a heavy responsibility on the staff members who counsel students to help them build the best possible program for the students' needs. As is indicated in the skeleton programs (this is essentially the program we use), there are a number of choices in every category in addition to a number of electives. A student and a counselor (one of our departmental staff) each seriously recognizing the importance of this building operation can develop an excellent program tailored to meet a particular set of objectives and needs. If neither the student nor the staff member takes this seriously, the result may be a near disaster.

Following is a skeleton undergraduate curriculum in agricultural economics:

	Quarter Hours	
Physical and biological sciences	16	(chemistry, biology, etc.)
Social Sciences	16	(government, sociology, etc.)
Humanities	16	(literature, philosophy, music and art appreciation, etc.)
Rhetoric	6	
Speech	3	
Mathematics and Statistics	8	
Health Education, P.E., etc.	5	

	Quarter Hours
2 Plant Production Courses	8
2 Animal Production Courses	8
Agricultural Economics Courses	28
Agricultural Electives	16
Economics	8
Accounting and/or Statistics	12
Business Courses	12
Electives	30
Total	192

Following is a skeleton graduate curriculum (M.S.) in agricultural economics:

	Quarter Hours
Economics and Business	12
Quantitative Methods and Techniques	8
Agricultural Economics	12
Thesis	8
Electives	8

Michigan State's Curricula in Agricultural Economics

LARRY J. CONNOR

THE undergraduate and graduate curricula in agricultural economics at Michigan State University have been subjected to intensive review and modifications during the past several years. This discussion emphasizes the new undergraduate curriculum, since it is a departure from traditional agricultural economics undergraduate programs.

Undergraduate Curriculum

The major impetus for changing the undergraduate curriculum came from a faculty retreat in 1969 when the faculty expressed dissatisfaction over the then existing curriculum. The consensus of the faculty was that the department needed to revise its undergraduate program drastically, and either "get into" undergraduate education or "get out." The department had an undergraduate major in agricultural economics. However, an agribusiness major and a food marketing management major were administered by a faculty member jointly appointed in the College of Business and the Dean's office in the College of Agriculture and Natural Resources. Therefore, potential majors were being split in several ways.

As a result of the faculty retreat, the department chairman appointed an *ad hoc* committee to develop new undergraduate curricula in agricultural economics. The committee addressed itself to the task of developing a totally new structure for undergraduate education instead of adding to or modifying the existing program. This was no easy task since many difficult questions had to be resolved, such as the appropriate approach to undergraduate education. The report of this committee was subsequently submitted to the faculty and to the College and University Curriculum Committees for discussion, modification, and ultimate approval. Course outlines were developed by committees of faculty with expressed interest in the subject matter.

The process resulted in the abolition of the old undergraduate major in agricultural economics and the creation of two new majors: food systems economics and management, and public affairs management. These two new majors now have been in operation for several years. While it is too early to judge their success, the preliminary evidence does appear to be favorable.

Food Systems Economics and Management

The food systems economics and management major (*FSM*) was developed to serve students better who wish to prepare for a career in some phase of the food system. The *FSM* major was developed in cooperation with the College of Business and essentially merged the former agricultural economics, agribusiness, and food marketing management majors. One can major in *FSM* in either college, with the difference being the college requirements he must meet. For example, a major in the College of Business must complete 56 credits in business, whereas a major in agriculture and natural resources must complete 16.

Emphasis in this major is placed on developing an understanding of the *total* food system, from the farm and farm supplier to the retailer to the consumer. A basic core of professional courses provides the student with both an understanding of the total system and tools for solving problems (Table 1). An introductory course emphasizes the organization of modern industrialized food production and distribution systems. This course is followed by core courses in food production management, food processing and distribution management, and public policy for the food system. Managerial economics, applied statistics, and another *FSM* course are required in addition to a basic core of business courses. The career emphasis of the student is accomplished through the selection of noncore electives from "additional professional courses" (Table 1). For example, a student wishing to return to the farm might select a number of courses in scientific agriculture Another student, with an interest in retailing, might select additional professional courses from the College of Business. The program, therefore, has the flexibility to serve the career interests of individual students while exposing them to the food system in its *entirety*.

Courses in food systems economics and management and public affairs management are listed under these titles in class schedules and not under agricultural economics.

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Table 1. Undergraduate curricula in agricultural economics, Michigan State University

Area	Major	
	Food systems economics and management	Public affairs management
Communications	15	15
Humanities	15	12
Social sciences	25	36
Mathematics, physical, and biological sciences	28	21
Total preprofessional	83	84
Professional core[a]		
Food systems economics and management	21	-0-
Public affairs management	-0-	28
Business	16	-0-
Additional professional courses[b]	33	40
Total professional	70	68
Electives	27	28
Total	180	180

[a] Minimum of 40 credits in College of Agriculture and Natural Resources.

[b] Specific courses must be approved by the academic advisor and may be selected from a variety of offerings.

Public Affairs Management

The curriculum in public affairs management (*PAM*) was designed both for the management specialist working in many different areas of the public sector and for those interested in the policy aspects of a specific field, such as education, social work, or health care. Public affairs management was designed to qualify young men and women for a wide range of responsible career positions in city government, county and other local governments, and various federal programs requiring local comprehensive planning. While this major was designed by the Department of Agricultural Economics, a public affairs management option in the multidisciplinary program of the College of Social Science has since been initiated. A public affairs management option in the Department of Political Science and a coordinated major with James Madison College, a residential college specializing in the study of public policy problems, have also been implemented.

The curriculum in public affairs management is shown in Table 1. A basic core of courses in public affairs management and other "additional professional courses" is specified to provide a student the necessary background. The *PAM* professional courses include core offerings such as economic policy processes; welfare, health, and education policy; social accounts and community choice; and public expenditures—theory and policy. Managerial economics, applied statistics, and six hours of *PAM* electives round out the core courses. Forty credits of "additional professional courses" may be selected from a wide variety of offerings, including economics, political science, sociology, and business. The purpose of these courses is to provide the professional specialization for a first job.

Although this is a totally new undergraduate curriculum, it is attracting majors as it gains exposure around the university. The basic courses have been well received by students not only in the College of Agriculture and Natural Resources, but in other colleges as well.

Graduate Curriculum

The graduate curriculum at Michigan State University was recently reviewed by a special *ad hoc* committee and by the faculty. While the review process resulted in modifications in course contents and offerings, the structure of the graduate curriculum was basically reaffirmed. The M.S. and Ph.D. programs both emphasize individual program development within a set of general guidelines.

Both a thesis and nonthesis program are offered for the M.S. degree. The nonthesis program includes less emphasis on research experience, but requires a research paper and more course work. Both programs include a major field in agricultural economics that may include courses from outside the department as appropriate to the student's goal. A second field is normally taken from outside the department, but may be inside when it is in the best interest of the student. As a minimum, all students are required to complete two courses in economic theory at the graduate level and two courses in statistics and college algebra.

A doctoral program in agricultural economics at Michigan State University consists of five fields. All students are required to complete a field in economics, general agricultural economics, and a special field in agricultural economics (the student's choice). Two additional fields are required, and at least one must be outside of agricultural economics. These additional fields are chosen in accordance with the professional interests of each student. Comprehensive examinations are required in each of the previously listed fields. With guidance committee approval, the comprehensive examination in one of the elective fields may be waived.

The equivalent of three statistics courses, algebra, and two calculus courses is required for the doctoral program. One of two economic theory sequences is normally taken, plus additional broadening experience outside of micro and macro theory. In addition to the usual dissertation requirement, each student must obtain a special skill area related to his probable career pattern. This may be a reading knowledge of one foreign language or a minimum of 12 credits of course work beyond the previously listed requirements.

Texas A&M's Curriculum

Jesse C. Grady

The Department of Agricultural Economics at Texas A&M University has developed and won approval of a new curriculum for undergraduate students. The new curriculum was neither hurriedly built nor without opposition, both internal and external. Undergraduate students participated in the building of the curriculum as an aid to maintaining relevancy. Members of the Department took deliberate steps to provide as much flexibility as possible. Most of the students had very definite ideas about the general area of work they wished to pursue. A larger number of options is being offered to accommodate the interest of students.

Factors of Change

The Department of Agricultural Economics at Texas A&M moves with the same deliberate speed of most other departments. A needed change in curriculum was not something that appeared suddenly, but resulted from a period of contemplation. A catalytic element was added in the form of an External Review Committee. Three able agricultural economists from out of state were asked to review the present program and provide recommendations. The committee did a thorough study within the department among groups of students, faculty, and administrators as well as among other departments whose students are provided service work.

The committee was able to view the department from a clearer vantage point since there were fewer trees. In due time a report by the Review Committee was made available to us. The report indicated, to no one's surprise, that the department was not perfect; changes for improvement were suggested. Any committee report is worthy of appointing another committee to review the recommendations. The necessary reviews having been completed, the Undergraduate Policy Committee was given the responsibility for developing a curriculum. Birth of a new curriculum, composed of five options for the undergraduate major, was achieved, but not without considerable labor pains.

New Curriculum

A new curriculum including five options has been brought to fruition. The five options, agribusiness, farm and ranch management, food and fiber marketing, resource economics, and rural development, are offered as providing the necessary conditions for relevancy to student interest, changing job markets, and needed flexibility.

Each option has a common first two years with minor exceptions for the farm and ranch management option as shown in Table 1. The differences largely result from external pressures and are compromises.

A central core of training is necessary for most students if an appreciation of the chosen area and requirements is to be developed. Further, during the first few semesters the student is not best prepared to determine exactly what area of work his or her talents are best equipped to pursue.

Students reaching their junior year have been exposed to enough work to make an evaluation of their choices, desires, and capabilities. Although there will be common courses during their remaining two years, there are differences in required work. Selection of an option at this point is crucial since consideration of work beyond the

Table 1. Semester hour requirements for undergraduate agricultural economics major at Texas A&M University, freshman and sophomore years, 1973

Area of concentrations	Semester hours
Agricultural economics	6
Agricultural electives	3
Business administration	7
Communications	6
Economics	6
History	6
Humanities elective	3
Mathematics and statistics	9
Physical or biological science[a]	6
Political science	6
Electives	6
	64

[a] Courses specified for farm and ranch management option.

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Table 2. **Semester hour requirements for undergraduate agricultural economics majors at Texas A&M University, junior and senior years, 1973**

Area of concentration	Agribusiness	Farm and ranch management	Food and fiber marketing	Resource economics	Rural development
Agricultural economics	Required 15 Elective 6	Required 18 Elective 6	Required 12 Elective 9	Required 12 Elective 9	Required 9 Elective 12
Business administration and economics	Required 6 Elective 15	Required 6 Elective 3	Required 15 Elective 6	Required 9 Elective 3	Required 9
Humanities	Elective 3	Elective 3	Elective 3	Elective 3	Elective 3
Communications	Required 3	Required 3	Required 3	Required 3	Required 3
Mathematics or statistics	Elective 3	0	Elective 3	Elective 3	Elective 3
Sociology, psychology, or political science	Elective 3	Elective 3	Elective 3	Elective 3	Required 9 Elective 3
Other	0	Required 12 (Scientific agr.)	0	Required 3	0
Free electives	10	10	10	16	10
Total hours	64	64	64	64	64

B.S. level must also be considered. Free and directed electives must be chosen wisely if the end product is to meet personal and external goals.

A block system (see Table 2) is used to provide flexibility in course choices in the junior and senior years. Each option requires 128 semester hours for satisfactory completion, which is eight semester hours lower than in previous years. The reduction will provide a competitive condition with other disciplines and will delete only courses that are expendable.

Any undergraduate student desiring to enroll for further work beyond the bachelor level will be counseled to include additional courses in math, statistics, and economics. Since students will have an opportunity to use free electives to strengthen an undergraduate option or prepare for graduate work, an effort has been made to stipulate only undergraduate requirements deemed desirable in each option and permit maximum flexibility.

Graduate Curriculum

The Department of Agricultural Economics offers three graduate degrees—Master of Science, Master of Agriculture, and Ph.D. The M.S. and Ph.D. degree programs are designed to compare favorably with similar programs at other universities, but the Master of Agriculture programs have unique aspects. Students working toward a Master of Agriculture degree will meet the same requirements for entrance to graduate school as others and will take courses that are as rigorous. The major difference in the training of the Master of Science student and the Master of Agriculture will be in the research requirement. The Master of Agriculture does not require a thesis, while the Master of Science degree does. An additional four semester hours are required of the Master of Agriculture candidates and a three-month internship with an employing firm, agency, or organization. The department currently offers four options to the Master of Agriculture candidate. Students interested in finance will elect the agri-banking option and will complete their internship with some financial institution. Likewise, students electing the agribusiness, commodity analysis, or rural development options will complete their required internship with an agribusiness firm or agencies that seek employees with training of the nature provided under these programs. Each of the options is designed to prepare the candidate for an action or management position rather than a research position The student is job-oriented and will select courses that best meet his particular interests. However, the degree is not a terminal degree or in any way considered to be an inferior degree. If the candidate decides to pursue a Ph.D. upon completion of the Master of Agriculture, he is in a position to do so. The candidate will lack research and thesis writing experience but will have a valuable work-study experience.

Teaching Method

RUSSELL P. KROPP

My remarks will deal with three subtopics related to teaching method: teaching and learning, an idealized teaching method, and instructional variables. My presentation will probably differ from what you anticipated; nevertheless, I hope you will find it to be worthwhile.

Teaching and Learning

I believe people have confused teaching and learning. My comments are directed to exploring this confusion, speculating about how it occurred, describing some consequences of it, and stating why the confusion needs to be righted. I contend that teaching and learning are frequently confused in higher education. Reading the literature of instruction in higher education leads one to make either of two inferences about the relationship of teaching and learning. First, teaching and learning are synonymous. Second, teaching implies learning. Unfortunately, neither is valid. Supporting evidence is close at hand. Teachers and students behave differently, so their activities are not interchangeable. One can observe in any classroom that teaching can proceed in the absence of learning. And talking with any student will reveal that he possesses knowledge which he obtained in the absence of formal or intentional teaching. In view of this readily available contrary evidence, why does one cling to teaching and seemingly overlook learning?

Teaching gained ascendancy over learning in instruction for many reasons, only two of which are mentioned here. For centuries the primary means of transmitting culture was by word of mouth. Lecturers were people who possessed knowledge and transmitted it in that manner. Surprisingly, lecturing became so entrenched that the invention of movable type, which made lecturing unnecessary, failed to dislodge it. Although lecturing has been outmoded for 400 years, its practice goes unabated.

The perception of the university as the model for higher education has contributed to emphasizing teaching over learning. In a complex university, the discovery of knowledge is the primary activity. Organizational structures, policies, and procedures are established to facilitate research. Potentially competitive activities, like teaching, are throttled. This muting is evident on many fronts. Many lower division courses are taught by graduate assistants. Equating subject matter competence with teaching effectiveness justifies this practice. It is beside the point that this use of graduate students is for economic reasons, not pedagogical ones. Furthermore, much of this teaching is unsupervised which leads to the inference that teaching effectiveness, if it is not guaranteed by the possession of knowledge, can be acquired effortlessly with a bit of practical experience. The university downplays teaching. Because its doctoral graduates find their way to administrative and professorial positions in traditional colleges and community colleges, the university model, along with its assumptions and values, is installed where it has no right to exist. Community colleges are aware of this incongruity; some reject applications from doctoral graduates believing the university has made them unfit for instructional service.

One might ask what consequences have resulted from attending to teaching rather than learning. The list is long, some of the conspicuous items are the following.

Instruction becomes inefficient. Although educational goals are stated in terms of behaviors which students should acquire, the appraisal of education is in terms of what faculty members do. There is not much chance to improve a process if the quality of the product it yields is unexamined.

Teaching becomes exalted. To show their commitment to quality instruction, higher education institutions give annual awards to faculty for outstanding teaching. Selection of honorees is done on many bases, none of which is the amount of learning achieved by their students. Regrettably, of teaching and learning, the institution makes the wrong choice, then gives it credence by making public display of it.

Evaluation of instruction becomes evaluation of teaching. Public and student dissatisfaction have caused colleges and universities to be more vigilant. An evidence of this is the heightened emphasis on the improvement of instruction. A chosen avenue to this improvement is the appraisal of teaching effectiveness. Again, the

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means are honored and the end is ignored. Students become unwitting partners in this displacement by being abetted in their wish to appraise annually the popularity of teachers, their sense of humor, the clarity of their assignments, the dispatch with which papers are graded and returned, etc. No determination is made whether students acquire the behavioral objectives.

Students must have high academic aptitude. When institutions tolerate inefficient teaching, by dwelling on teacher actions rather than student achievement, then students must be sought who are so capable that they might learn independently of the system. The selectivity of colleges and universities is partially attributable to the unresponsiveness of its instructional procedures. Academically elite students must be fed to the instructional assembly line because they are the only ones who can survive it. Lower ability students would have to depend on the system for support, which would not be forthcoming.

Teaching becomes an accepted way of measuring work. Work loads are stated in terms of semester hours taught, e.g., 12 semester hours of instruction at the undergraduate level is a full load. State legislatures then become prone to mandate work loads in terms of hours taught or classroom contact hours; e.g., the State of Florida has a 12-hour teaching law for its State University System. In both cases, attention is misdirected; the means is mistaken for the end. Instruction is transmuted to teaching, and teaching is transmuted to putting in a fixed number of hours. The intention was understandable, but the result is a misfortune.

The confusion of teaching and learning needs to be righted as soon as possible. The adjustment would consist of attending to learning and evaluating teaching in terms of the learning it produces. Many benefits of doing so can be foreseen.

Teaching effectiveness would be significantly and quickly improved. Comprehensive evaluative studies of learning would clearly reveal the breakdown in instruction which is now obfuscated. A major reconceptualization of teaching would occur: the learner would take the center of the stage, the professor would become a facilitator rather than a histrionic performer, and teaching would become an instrumentality instead of an end.

Colleges and universities would be more capable of serving the students who seek admission. A college degree is a symbolic asset in our society and benefits the holder. More diverse segments of our society wish to possess this symbol. Colleges must prepare for service to an egalitarian society by moving in some areas from its traditional posture of elitism. One area which must be reformed is the instructional assembly line which is now suitable mainly for an elitist population.

The cost of instruction would probably decrease if more efficient methods were used. If amount of learning, rather than time served, were the means of terminating a course of study, and if instructional methods were used that enabled students to proceed at their own rates, then reductions would occur in instructional time of faculty and students, and the cost of each unit of achievement would probably decrease if ability were held constant.

Colleges and universities would more likely be able to cope with the life-long learning needs of citizens. Knowledge accumulates so rapidly that vocations and vocational skills soon become obsolete. The periodic retraining of adults seems to be an inevitable societal necessity. Colleges and universities could serve this end more effectively by discarding their conventional techniques of instruction. These dysfunctional methods are teacher-centered rather than student-centered. Techniques must be adopted which facilitate learning, whether or not the students are physically in daily contact with instructors.

Finally, teaching would come to be recognized as a highly complex and valuable profession which requires considerable training and ingenuity. It is staggering to consider that the majority of Ph.D. graduates become teachers, yet only a handful of them know anything about the facilitation of learning. Perhaps it is a partial explanation of the mounting dissatisfaction of students and their flight to alternative modes of education.

An Idealized Teaching Method

Let us now turn from this analysis of the confusion of teaching and learning to consider the ingredients of an idealized teaching method. First, the ideal teaching method should provide a clear and detailed statement of the educational objectives which are held for the learners. These objectives should be defined in terms of the behaviors that a successful learner would exhibit. A statement of objectives would help focus teaching. It would inform the student of the expectations which are held for him, and it would provide him with references by which to assess his progress.

Second, the idealized method should provide entry tests or pretests. The results of these tests would have many uses; excusing students who already have achieved the objectives, placing properly in the instructional sequence students who have partially achieved the objectives, and identifying students who lack the prerequisite skills and therefore have small chance of progressing satisfactorily.

Third, the instructional materials should be in a self-instructional format so that each student can complete them at whatever rate is comfortable for him. The materials should be reduced to instructional packages which contain unit tests. Students should be constrained to respond successfully to unit tests as a condition of proceeding to the next unit in the sequence. These instructional materials would be presented to the student through tapes, slides, films, and videocassette recordings. He should determine when and how he uses them. He would have access to a computer terminal for problem solving and simulation. He might also complete a workbook which would be an integral part of the instructional package.

Fourth, alternate sets of instructional materials should be available so that learners having different levels of aptitude and different backgrounds can be accommodated. Individualized format provides for the significant aptitude of speed of learning on which students differ widely. However, instructional materials must also serve other learning variables as much as possible. As admission procedures grow less selective, instructional materials must be revised and expanded to provide for a greater range of abilities, interests, backgrounds, and aspirations.

Fifth, in addition to preparing these instructional materials and monitoring the progress of students through them, the instructor would diagnose individual learning problems and provide remediation, hold group meetings of students when that setting is more likely to expedite achievement, and provide course, curriculum, and career advisement to course registrants.

Finally, an overall appraisal of achievement should be made so that information is gathered about two concerns. First, the achievement of each student on each objective should be ascertained. Second, the goodness of each instructional package should be determined by studying student responses to the unit tests which are part of them. Student response data are a useful guide to needed curriculum revision.

This idealized conception of teaching gives the instructor an extremely important role, but it is not as conspicuous as when he is the chief classroom performer. Here he becomes the creator and manager of a learning environment. His major contact with students occurs when they encounter learning breakdowns. This idealized teaching method is vastly more demanding on the teacher than are the roles associated with more conventional methods. This new role of the teacher requires that he have highly specialized skills of a kind which he does not now acquire in his graduate work. Furthermore, it is obvious that one's teaching becomes the central activity of his scholarly or professional life.

Variables Pertinent to Teaching Method

Permit me to mention factors that should be taken into account in selecting a teaching method. Until now, the choice of a teaching method had not been difficult. It went something like this: if the course is undergraduate, then lecture; if graduate and large, lecture; and if graduate and small, then a mixture of lecture and discussion, or seminar. But the era has ended in which such straightforward and unequivocal rules-of-thumb like these were useful, if they ever were. New dimensions have emerged and must be included in decision-making. Demands for accountability require that choices be made rationally or empirically instead of in accordance with tradition. Pressure is being exerted for clear statements of instructional goals and the evaluation of student achievement of them. This stimulates faculty to seek more efficient methods. Economic stringencies cause academic departments to search for more effective methods of meeting obligations. The cumulation of these events causes departments heads and faculty to grow reflective about how their work should be conducted.

No pretension is made here that for every teaching situation there is a perfect method if only one can locate it. That simply is not the case. Furthermore, there is no general formula, encompassing the major variables, that will even suggest the family of techniques which might be most useful in a given situation. At best, one can only list and describe the major dimensions and hope that they will be taken into account, by some unknown calculus, when the decision is made.

The prevailing instructional pattern must be recognized. The most common one might be characterized as involving fixed instructional time and resulting in variable achievement. For example, a class meets for 50 minutes, three times a week for 16 weeks. At the end of that time, student achievement is evaluated. Students are labeled with a letter grade denoting their relative achievement and are then passed on to the next instructional station. This mode is a genuine comfort to registrars, business officers, and academic departments that offer instruction as a background activity to fill lulls in research and consultation. A competing mode of organizing instruction might be characterized as variable time and fixed achievement. In it, a student takes as much time as he needs to attain a predetermined level of mastery. When he achieves it, then he moves on to the next course. The fixed time pattern enables handling large groups of students simultaneously, the variable time pattern requires treating each student individually. Individual differences are handled in the former by a variety of end-of-course grades; they are handled in the latter by varying instructional time. The variable time method is enjoying wider usage and will eventually displace the other pattern. As you will observe, compatible teaching methods will differ from one of these organizational formats to the next.

Facilities within the partial or full control of the academic department bear on what teaching methods might be selected. Whether classrooms and teaching laboratories, as one kind of facility, are exclusively available is a matter of importance. Individualized learning techniques require that special rooms be devoted to that purpose, as do other techniques which place instructional materials at the disposal of students on a schedule convenient to the students. The availability of educational hardware, as another kind of facility, bears directly on teaching method. If a department or instructor must borrow equipment from a media center whenever he wishes to use it, then individualized courses and the enrichment of instruction through films, slides, and videotapes is unlikely.

The investment which an academic department wishes to make in instruction is a major factor in determining what teaching methods will be used. Audio-tutorial, computer-based, and video courses require heavy initial outlays for producing instructional materials and acquiring equipment. Although instructional techniques which incorporate these kinds of equipment enable the instructor to take the role for which he ought to be uniquely capable, most academic departments do not have enough money in any academic year to develop a technologically rich form of instruction. The number of students who will take the course each semester, whether the course will be offered in all semesters, and how many years the course will be offered are all pertinent in decision-making. It is more sensible to make large expenditures on heavy enrollment courses than ones with light enrollment. However, required courses which capture a large annual enrollment literally invite the adoption of low-cost techniques that free money for departmental expenditures on other courses and activities.

The kind of learning which one is attempting to foster in students is especially important. Knowledge and comprehension can be developed by the simplest of techniques, including correspondence courses and independent reading. Application and analysis require more structure in materials and/or more intervention by faculty. Evaluation and synthesis require much intervention by the teacher with each student. The development of complex physical skills, as in medicine and dentistry, requires special teaching laboratories, live or recorded demonstrations, hands-on experience, and professional evaluation of performance. Attitudes seem to be taught best in group settings where interpersonal discussions can occur.

The aptitudes which students bring to instruction should be given weight when choosing a teaching method. When the range of academic aptitude is broad, when backgrounds are diverse and lacking in common elements, when student aspirations and motivations are quite different, one is almost compelled to sort students into smaller groups for instruction or to adopt an individualized format so that differences might be accommodated.

In closing I wish to draw attention to several realities of academic life that militate against making instruction as good as it could be. The lock-step, fixed-time, variable achievement format is a straight-jacket that impedes innovation. Faculty know very little about educational psychology and instructional technology, two items which ought to have been staples in their educational diets from the time they aspired to collegiate careers. Excellence in teaching is locally valuable, as opposed to excellence in research which has national currency, and bears hardly at all on "making a contribution to the discipline" which is a traditional standard of appraisal. Departments simply do not have a history of putting large amounts of money into course development. Departments traditionally make investments in faculty and permit faculty to dominate courses; it would be well to make investments in courses and have them dominate faculty if only to redress the balance. Good instruction costs more than bad instruction; many departments are already financially pinched. Finally, any operating unit, whether department, college, or university, cannot optimize all of its subsystems without sacrificing the overall goal. Instruction will always fare less well than it would were it the exclusive activity. None of this is meant to discourage anyone who wishes to improve learning. The field is wide open, the need is great, and there is tremendous room for maneuvering within the boundary conditions I have mentioned.

Techniques for Motivating Students

James G. Kendrick

Although I, along with the Program Committee, selected the title for my remarks, I believe my theme can be more clearly advanced with a slight change of emphasis—techniques that lead to student motivation. If techniques exist that can accomplish self-motivation, I submit that the instructor's job would become considerably simplied as he manages the learning process and watches the students teach themselves.

Professor Kropp [1] has distilled the key issues in the complex teacher-student relationship, i.e. teaching vs. learning, the need to decide if we as teachers are really interested in learning, the realization that students are smarter than we believe, and the possibilities for self-instruction through the creation of a learning environment.

During my 10 years at the University of Nebraska I have been extremely fortunate. I have been afforded the opportunity of appearing before students in the classroom. I have been able to observe the techniques employed by superior instructors, to serve with dedicated teachers on course of study, teaching improvement, and quality of instruction evaluation committees and have been lucky to have administrators that truly believe in and work toward teaching excellence. I give this background only to highlight a necessary condition for quality instruction—the creation of an atmosphere throughout a department and college where teaching is viewed as both important and a privilege.

Thus, the first technique for motivating students is to believe honestly that teaching is important. Believe it at the college and believe it in the classroom. Students seem to be intuitively capable of detecting attitudes, and if teaching is thought to be serious business, then learning also becomes serious business.

At the University of Nebraska, the general policy of the College of Agriculture is to permit only assistant professors or above to meet freshman classes. Instructors, such as a recently hired lawyer teaching agricultural law, are used to fill specialized needs. Our Director of Resident Instruction tries never to let us forget that we are permitted to teach, not assigned to classes. I am not playing with words here, for if the teaching staff is permitted to teach, a competitive environment is established that forces the individual instructor to strive for excellence. Needless to say, dedication to teaching must be rewarded, and at our college teaching ranks equally with research when the administrators divide the salary pie.

A college commitment to quality instruction generates problems that require solutions if real learning is to take place. Classes increase in size. College commitment to budget increases for additional teaching are justified by present overloads. First generate the overload and then obtain the additional teachers. Given a competitive teaching environment, the additional staff creates additional overloads rather than provides relief to problems that accompany larger classes.

I am convinced that dedication to teaching means large classes. The problem is how the instructor can motivate the individual student in a sea of faces and still retain his sanity at the end of the semester. Years ago, the sane instructors counseled me that the only way to exist in such an environment was for the instructor to become as lazy as possible by providing gimmicks that permit the students to teach themselves much of the course material.

Now terms like "lazy" and "gimmicks" are for internal use only and are not recommended syntax for administrators or legislators. Can a teacher be lazy, use gimmicks, and still teach effectively? I have become convinced that effective teaching requires a lazy instructor and will now hasten to justify this apparent heresy.

Over the years, I have attended dozens of teaching improvement workshops, meetings, conferences, and discussion groups. Use of TV lectures for servicing large classes was a panacea offered at an early workshop. However, the amount of effort required to think through a semester's work, organize it in some rational manner, anticipate the questions that would come from a live class, provide answers on tape, keep the lectures lively, and expend the amount of time required for filming, editing, and re-filming and re-editing—is horrendous.

A few, non-lazy instructors took the year of week-ends and vacation time required to place a course on the "'tube." The result was that after an initial student enthusiasm that always accom-

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panies a new technique, the ingrates complained vigorously to the administrators concerning the lack of learning taking place and the impersonal nature of the process.

Another workshop, held a few years ago in Illinois demonstrated the latest technology in audio-tutorial instruction. Slide sets, eight mm film loops, tape cassettes, and the construction of physical facilities with banks of learning carrels were fully explained and praised. The participants were cajoled to place their courses into this new teaching environment. Again, the hard workers rose to the challenge—a challenge greater in my estimation than the effort required to video tape lectures. Hard-working instructors became producers, directors, carpenters, photographers, and audio experts; the students were again bored after too short a time considering the effort expended.

Independent study is still advanced as one method of recapturing the teacher-student relationship that must have existed between Socrates and Plato. Given the large class syndrome that accompanies devotion to teaching, hard workers who place their courses on an individualized independent study basis soon develop glazed eyes and noticeably strained family relationships as they are forced to have one student conference after another. They read and re-read, edit, comment upon, and grade a stack of unrelated student research papers that threaten to eclipse their bookcases. The student soon finds the instructor increasingly unavailable or unapproachable and becomes somewhat disenchanted with his self-learning efforts.

This June I had a small hand in the development of, and participated in, yet another teaching workshop sponsored by the Northcentral Directors of Resident Instruction. This time the technique was CAI, and the advocates of computer assisted instruction informed us that the computer could take over the details of instruction leaving the professor free to concentrate his efforts upon the management of instruction. I confess some understanding of computers, and in my judgment the man-years required to construct the programmed learning trees, the pre- and post-test branch back networks for any course that has real substance makes TV and audio-tutorial preparations seem like child's play.

Not that CAI is impossible, for I have seen CAI courses that are used to instruct medical doctors on the complex techniques of diagnostics. Calculus can and is being taught completely through CAI instructional terminals. A few colleges have or are moving toward switching all their course work over to computers. The CAI experts suggest that it requires over a man year to place a course into the computer, and the hard workers have again risen to the bait that requires the commitment of nights, weekends, and vacation time since year-long sabbaticals are not common at our institution.

The students are enthralled with CAI. They can progress at their own pace, take "courses" when they want—on Sunday, if they wish, and take off for a few days skiing trip. But these were the same advantages listed for audio-tutorial instruction. I now hear rumblings that after millions of dollars have been expended for full CAI facilities, the ungrateful students are once again becoming bored. The students I employ to run computer programs say they can only work at top efficiency on a cathode ray terminal for about half an hour. After that time they become hypnotized by the light cursor as it weaves its magic over the screen.

In the critiques that always follow teaching workshops, I have hypothesized that if the growth in new concepts of instruction continues at present rates, then a relevant topic for some future group might be to explore that newest of teaching methods—the lecture.

Independent study, audio-tutorial instruction, courses via TV, CAI and even the lecture—each of these *alone* requires great effort by the serious teacher and often results in bored students and thus non-optimal learning situations. However, I have observed that a judicious mixing of all these instructional methods has great advantages for the instructor and for the students.

For that group of students that is gifted with high IQs, possesses great self-motivation, and becomes bored with the lock step progress of standard curriculums, we should establish an honors program that permits them to take any course they wish without prerequisites. They would develop a program and defend it before a small supervisory committee. At Nebraska, College of Agriculture honor students have 124 elective hours and only two required seminars. Our experience has been that the main job of the supervisory committees is to suggest easier courses in the student's program. Our honor students do not earn straight A's; B to B+ would be typical since they are taking course work without the normal background material. They enter courses that are a little over their heads, study hard to make up their deficiencies, and find little time to become bored. Honor students without honor courses—the instructor's job is simplified by a reduction in requests for individualized independent study.

The lazy instructor can now spend time with the relatively few students who request credit for pursuing in depth a topic of special interest. Even lazier is the instructor who meets with students working under him in independent study as a group and has the group debate and approve the topics and methodology. Here the instructor manages the learning situation and the students do the work, even going as far as primarily evaluating each others' efforts.

I have found many concepts difficult to present adequately in a lecture format. We use computerized gaming simulators, many modified from the original programming work conducted at Purdue. In one simulator, the concepts of oligopoly introduced in lectures are reinforced by dividing the class into teams. Five students comprise the board of directors of each team in the simulation. The board must make weekly decisions on pricing strategies and many other variables. When I lecture about management strategies under various organizational and conduct structures, the students pay attention since they can use the knowledge in their "'firm." Lecture topics flow from the results of a particularly good or poor decision.

At least three of our department courses are built around simulators, and during the semester you find "board meetings" taking place day and night in department conference rooms, dorms, coffee shops, and in student lounges. There are five board members, but only one decision permitted per team. Each student tries to convince the other four of the virtues of his analytical process, and learning takes place. The lazy instructor gets credit for a job well done.

We use the concept of student teams in many ways. Classroom instruction concerning the intricacies of futures market applications to farming and agribusiness situations is supplemented by having student teams compete in a semester-long hedging and speculation problem. The efforts of the teams and the current real world situation provide many opportunities for lectures, saving the lazy instructor the time that was formally devoted to asking himself, "What am I going to talk about in tomorrow's lecture?"

Our department statistical courses also employ student teams to solve complex problems on the computer. Here the emphasis is on the methodology and the interpretation of results which the students present to the class unburdened by the busy-work associated with hand calculations.

In one production economics course the students are divided into linear programming teams and are required each week to solve problems that illustrate a particular theoretical issue. Since different problems are assigned to each team, the lazy instructor asks wise questions of the student presentations and is praised for the relevancy of his material.

The same approach is used in our computer feed formulation course with an even lazier modification. Rather than have a single instructor take effort to become knowledgeable in the economic, biochemical, and nutritional intricacies of beef, swine, poultry, and dairy ration formulation, we use five instructors, each an expert in his field. The students solve complex ration formulations after four hours of computer instruction. Self-instruction takes place as the teams prepare their results for presentation to the full class. The students are exposed to five professorial lecture techniques, the computer takes care of the details of matrix invention, and the instructors receive comments such as "the best course I have ever taken" for their minimal efforts.

In policy classes the students form research groups that explore in some depth topics that interest both them and the instructor. Many student research efforts are either published in department reports or are presented to other staff, political, or business leaders through seminars. Some of the student efforts in policy have resulted in extension publications; others have been known to serve as the basis of research grants for staff members, and some have even appeared in speeches by state and national politicans.

Many a bad lecture has been prevented by a lazy instructor who was able to convince a fellow staff member, a political figure, community leader or anyone with specialized knowledge to spend a few minutes with his class. The secret is not to let the visiting firemen lecture, but to start off with questions. This permits the lazy instructor to control the presentation, and the students praise the effort as innovative. We hope to become even lazier in the near future as we install lecture phone hook-ups in our classrooms. Here the instructor can call an expert anywhere in the nation for a quick five minute session with the class.

Mixed techniques are the key. The department had an audio-tutorial laboratory. It is not a pretentious installation, having two learning carrels only. We use it to supplement lectures, not replace them. For example, concepts of price discrimination are among the theoretical points I devote some time to in my marketing lectures. To some students this is heady stuff as they debate with me the present and future applications to agricultural marketing situations. However, details of the mathematical treatment can often overshadow the basic principle. I spent about a day putting down on paper a few examples, photographed my efforts with the department camera, and talked into a cassette tape recorder. Two primitive half-hour mini courses in price discrimination were the result for a cost of about $5. While not complete courses, the audio-tutorial tapes permit the students to listen to the instructor in the lecture hall and listen again to a slightly different treatment of the subject in the laboratory, as often as they wish. For the lazy instructor this saves untold time outside of class that was formally devoted to student requests to "explain that thing one more time."

We now have about 25 mini concepts in the laboratory, covering subject matter from elasticity to the techniques of derivation. Students are pleased because the instructor is always "in" to explain a particular point.

About a year ago my children, who were then just discovering the wonderful world of addition and subtraction, would take me away from the quiet enjoyment of a before-dinner cocktail by requesting that I write down some problems for them to work. I would, but then their answers would require grading and the establishment of a total score. One weekend I spent a few hours writing a little program using one of the interactive computer languages. It took about ten minutes of instruction to show them how to use the remote terminal and call up the program from disk storage. The computer now generates their problems, keep track of their responses, corrects their mistakes, provides final grades, and now Dad can think of other things—like, "Why not write similar programs for my students?"

At Nebraska we are fortunate to have a computing network with many remote terminals, over 100 at last count, mostly cathode ray tubes. While full CAI requires man years of input, small interactive drill, practice routines, and mini simulators can be easily constructed. A number of the teaching staff are writing these little demonstrations to pound into the student concepts that require repetition to achieve full understanding. The concept of demand elasticity and the resulting effects upon gross income is one of the mini concepts available to students. They can submit situation after situation to the interactive program, see the results immediately, and not become bogged down in the mechanics of mathematical calculations.

Some interactive computer languages are relatively easy to learn, and our students solve many of their production economic and statistical homework problems by writing small routines through the computer terminals. The instructors are aware of this practice and counter this gambit by assigning problems that would require days of hand calculation. The result? Students learn more since the complex problems more closely approximate reality and boredom is reduced with the realization by both instructors and students that note mathematical operations have no place in course work which purports to teach agricultural sciences.

A fellow staff member at the college is nearly as lazy as I am. He has developed a number of mini-models for computer supplementary instruction. However, he and I have both found that students need some instruction in remote terminal operations if we want them to take full advantage of self-teaching situations. To keep the questions in our office to a minimum, we spent about a week with a video recorder working on the terminals. Six half-hour TV lectures resulted. We did not have a script, nor were we bothered with directors and producers. With a camera on the remote I would ask the typical dumb questions that we have been asked so many times, and he would show me how to solve my problem.

These amateurish efforts will be used by the computer network to instruct new employees and students. Tapes can be piped into classrooms over closed-circuit TV and are also available for individual student use at the media centers on campus.

Variety in instructional methods promotes student interest and permits learning to take place. Variety means that the instructor does not have to spend the time in preparation required for a full TV, CAI, audio-tutorial independent study, or lecture presentation of his material.

I have stressed laziness and gimmicks; for those who require more academic-sounding terminology, I substitute flexibility for laziness and for gimmicks I suggest multiple teaching techniques.

Workshop Summary and Evaluation

Carroll V. Hess

First of all, permit me to commend both the Executive Committee of our Association for its fine support of this workshop and the Education Committee for its splendid effort in planning and executing this excellent workshop. My remarks will be divided as follows: brief reminder of workshop goals, as I viewed them; summary of the workshop—its highlights and possible inferences; personal evaluation and recommendations; and summary of your evaluative remarks and recommendations as provided by John Wildermuth.

Workshop Goals

I view the workshop as an opportunity for professional agricultural economists in academe, agribusiness, and in public agencies to:

1. analyze critically curriculum goals, development, and structure couched in a framework consistent with the broader and more comprehensive goals of the total university in an age of burgeoning enrollments and increasing demands by the public for greater relevance and quality education at minimal cost; and
2. examine the future specific manpower needs (or market, if you wish) for professional agricultural economists as a basis for (a) planning undergraduate and graduate curriculum, course development, and design of instructional techniques and (b) providing an academic climate conducive to the maximization of student learning in relevant areas.

Highlights

Two excellent papers by Bishop and Mosher launched the workshop on Wednesday morning. Bishop set the stage by reminding us that universities have been one of the major sources of knowledge, and subsequently, a mutual interdependence between education, culture and the structure of society has developed, forcing universities to accept the responsibility for "identifying and exploring intellectually major issues that confront the nation." The knowledge explosion of the past three decades has entailed huge public investments in research and educationally-related efforts of universities. The public is generally aware that the problems of urban and rural development, resource utilization and conservation, environmental quality, and quality of life generally can be traced, in large part, to social costs of technology. According to Bishop, "'The university community must give greater consideration to social costs of technological change and must assume a more critical attitude toward their research and educational efforts and its effects on society."

He cautions us not to be undermined by overemphasis upon the training of students for particular occupations. Rather, he says, the challenge is to produce "adaptable specialists" and to provide them with ample opportunities for continuing education. This calls for greater attention to multidisciplinary programs for students of tomorrow.

I support his views and, therefore, challenge our profession to provide the leadership on campus to examine continually our research and educational efforts in agricultural economics and to exert influence in related disciplines to do likewise. Where else, than in agricultural economics departments, can we find a faculty who should be sensitive to the nation's ills, understanding of the forces producing these ills, and with the dedication and commitment to conduct research and offer educational programs, as Bishop says, that are consonant with the complex problems of at least rural America? Are we up to it? That is the challenge that Ed Bishop tried to leave with us.

I was inspired by the succinctness of his treatment of the topic "Reorientation of the University." No greater challenge or opportunity has ever been afforded the modern land grant university. In my judgment, the agricultural economics profession has the necessary expertise and, hopefully, the will to tackle this task. Be thankful for this opportunity in this age of public disenchantment with higher education. Let's Go!!! The sooner we act responsibly, the less likely we are to have external forces exert control over the universities.

Art Mosher sketched so well the role of the social sciences in coping with today's social ills, both from a research standpoint and our opportunities to contribute to the diverse social science needs of the different groups of students on campus today. He identified four distinct groups of

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students and urged that they be treated separately as we design curricula, courses, and instructional techniques. Here again, he is emphasizing the role of educational objectives in educational planning. I concur wholeheartedly. Our student body is heterogeneous; let us not ignore this and treat them as a homogeneous body. What are their specific needs for general education, for professional education, or for occupational training? What unique contribution can the social sciences, more specifically, agricultural economics, make to their education and training?

Helmberger and Boddy provided some very valuable data on trends in number of graduate degrees granted, trends in starting and current salaries, and some insights into the future. These trends have major implications for curriculum planning, course design and instructional approaches. John Helmberger's suggestion of a three-tract graduate curriculum merits our serious and immediate attention if we are to "tool up" to meet future professional and technical manpower needs. It is our role to anticipate changing manpower needs and plan accordingly.

I think most of you not only enjoyed Russ Kropp for his style of presentation, but also for his candidness, vision, and thought-provoking remarks on principles (concepts) and methods of curriculum development. His central theme was, "Let us be student centered—not teacher centered," in defining curriculum goals. Let us place the student not the professor, in the center of the stage. He emphasized several times that the overriding principle is that of variable time—fixed mastery. This means consideration of learner costs, not just instructor costs. We need to evaluate performance in terms of learning rather than just inputs of faculty time, facilities, and related hardware and software. He also stressed relevance, flexibility, and accessibility. Let us imprint some of these principles in our minds as we return home and consider curriculum building, design of courses, and instructional techniques.

Manderscheid's paper complemented the Kropp paper very nicely. His historical review of curriculum building and potential impact of the various CEANAR reports was valuable. His concluding remarks and hypotheses are deserving of our consideration.

The four panelists who discussed curricular models, namely, Miss Parker, Walt Wills, Larry Connor, and Jess Grady, presented some intriguing curriculum developments on their campuses. These should give most of you greater courage to go home and press for greater imagination and foresight in curriculum planning. I offer two notes of caution: institutions have personalities, and therefore there is no single best curriculum structure—each institution must fashion its own; and the best designed curriculums do not necessarily insure quality and relevant learning. The key to quality education rests with properly designed courses that are effectively taught. I think faculty and administrators too often become so enchanted with curriculum review and building that they lose sight of the important determinants of effective instruction.

I commend the planning committee for incorporating the roundtables in the program. For the most part, I feel they served as a valuable forum for faculty to ineract with agribusiness and public agency personnel on how best to prepare students for careers in business, teaching, reseach, extension, and public service.

Dr. Kropp's paper on "Teaching Method" brought us up short and reminded us that teaching and learning are not necessarily synonymous. To quote him, "Teachers and students behave differently, so their activities are not interchangeable . . . teaching can proceed in the absence of learning." Likewise, learning can and does often occur in the absence of teaching. Therefore, he insists, an evaluation of instruction should be not of the teaching but of the learning. Did learning really take place? We should be more innovative in our instructional approaches. Our instruction should be characterized as variable time—fixed achievement. The instructor should become the designer of multiple teaching techniques, emphasizing the student rather than the teacher.

Jim Kendrick's remarks were very refreshing and informative. His lazy professor gimmicks emulates much of Kropp's idealized teaching method. We should take some of his gimmicks more seriously.

The panel on "Evaluation of Teaching and Rewards" provided an exceptionally fine exchange between two faculty members and a department head. The faculty (Rehberg and Koch) were saying, "Colleagues, our administrators are charged with the responsibility for evaluating us. Let us get with it and make certain they have the information needed to do the job." The administrator (John Malone) was saying, "'Faculty, we have not done as good a job in evaluating you as we should, but with your cooperation, we can achieve mutually beneficial goals." I often say to faculty, "You expect us to know, but we are not supposed to find out." Greater faculty cooperation and administrator zeal can help resolve this dilemma.

Evaluation and Recommendations

1. The potential contribution of such workshops to improving the quality of undergraduate and graduate education in the profession is far too great to limit participation to a small group. Therefore, I recommend that participant invitations to future conferences be broadened to include more teaching faculty in both land grant and nonland grant institutions; greater number of undergraduates and graduate students; and more representatives from agribusiness firms, governmental agencies, and other clientele groups served by our profession. One solution might be regional workshops every year or two, followed by national workshops held every four or five years. The dynamic nature of professional and technical manpower needs and the necessity of being sensitive to these changing needs in our educational planning dictate that the profession devote considerably more attention to these issues than has been given in the recent past. To my judgment, your colleagues in research and extension have devoted considerably more attention to evaluation and formulation of more relevant programs.

2. For the planning of future workshops, I recommend that future planning committees include a representative from the AAES Student Affairs Committee and the Selection Committee for the Distinguished Undergraduate Teacher.

3. Greater efforts should be exerted to make such workshops an integral part of the AAEA meeting. Efforts should be made to provide greater professional visibility.

4. Future conferences should be structured to insure adequate time for informal discussion and exchange of ideas. Participants should be encouraged to bring along descriptive materials on curriculums, courses, instructional approaches, and other innovative efforts, to share with colleagues.

5. I firmly believe that we need to urge ourselves in such workshops to develop at least minimal guidelines on such questions as curriculum requirements, possible options, and course titles to assure some degree of uniformity in standards and language.

6. I have had the feeling throughout the workshop that most of you were mere spectators, not true participants in the sense that you felt free to challenge, to argue, and to recommend. You have been far too polite. You were selected by your department heads to be participants, not mere spectators. I challenge you thus: what did you contribute and what specifics have you learned that might have a potential impact on your own programs? Maybe more small group discussions would have encouraged more vigorous interaction, particularly with the younger faculty. Also, have you industry and government agency personnel felt that you were really heard and that agricultural economics programs in the future will reflect your critiques and suggestions? Many of you have alternative sources for recruiting professionals.

Perhaps I have been a little too critical, but the costs in participant time and travel, and more importantly, the opportunities for improving the quality of education for our students, are far too great merely to get together for several days without exerting every possible effort to maximize the potential benefits.

And again, many thanks for according me this privilege. I cherish these professional associations and will welcome similar opportunities in the future.

american journal of agricultural economics

AAEA Annual Meeting
Texas A & M University
College Station, Texas
August 18–21, 1974

1973 PROCEEDINGS ISSUE

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BRANDOW · Agricultural Policies of the U. S. and Canada
GILSON · Canadian View of Agricultural Policies
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Volume 55 Number 5
December 1973

AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS

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It is the basic objective of the JOURNAL to promote creative and scholarly work in agricultural economics. Since there is no universally accepted definition of agricultural economics, the editors do not have a prestructured view of the JOURNAL's content. Manuscripts, however, which have no apparent relationship to the economics of agriculture, natural resources, and/or rural and community development will generally be excluded from consideration. The editors encourage submission of papers in the extension, teaching, and business phases of agricultural economics, as well as research manuscripts.

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SUBSCRIPTIONS

Members of the American Agricultural Economics Association receive the JOURNAL as part of their membership. Yearly subscriptions, $25; individual issues, $5.

Correspondence regarding subscriptions, orders for individual copies of the JOURNAL and changes of address should be sent to John C. Redman, Department of Agricultural Economics, University of Kentucky, Lexington, Kentucky 40506.

THE AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS is published five times a year (February, May, August, November, December) by the American Agricultural Economics Association. Prior to 1968, this JOURNAL was the JOURNAL OF FARM ECONOMICS.

Printed for the AAEA by Heffernan Press, Inc., Worcester, Massachusetts, USA.

Second class postage paid at Lexington, Kentucky, and additional mailing offices.

american
journal of
agricultural
economics

Vol. 55 No. 5 December 1973

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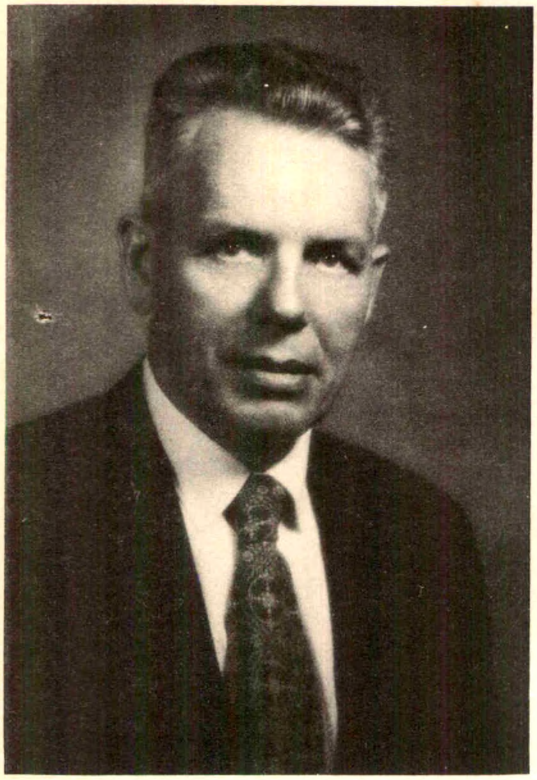


1973 AAEA FELLOW

Harold F. Breimyer

Perry Foundation Professor of Agricultural Economics and Extension Economist, University of Missouri-Columbia, 1966–

Vice-president, AFEA, 1964; President, AAEA, 1969

Economist, Agricultural Adjustment Administration, Bureau of Agricultural Economics, and Agricultural Marketing Service, 1936–59

Staff Economist, Council of Economic Advisers, 1959–61; Agricultural Marketing Service, 1961–65

Author, Individual Freedom and the Economic Organization of Agriculture, *1965*

Harold F. Breimyer has won wide acclaim as teacher and essayist concerned with economic institutions and how they relate to the human being. Never a tenant of the ivory tower or a respecter of disciplinary boundaries, he has demonstrated a capacity to communicate with professional, student, and public audiences about a broad range of topics.

Following his early years in the Bureau of Agricultural Economics, Harold Breimyer established a reputation for concise analysis and effective writing as USDA's livestock outlook economist. As his interests broadened he moved into staff economist positions in the Council of Economic Advisers and the Agricultural Marketing Service, which provided schooling in the governmental aspects of economic organization. Further scope-widening were his experiences abroad—as a member of an early cultural exchange delegation to the Soviet Union and in short-term assignments in Argentina, Guatemala, Peru, and Colombia. He has since conducted seminars in agricultural policy for top civil servants of Ministries of Agriculture of developing nations.

While serving with USDA he taught at the USDA Graduate School, Montgomery Junior College, and, as visiting professor, at the University of Illinois. Teaching and extension as a second career began in 1966 at the University of Missouri, where he now holds the Perry Foundation Professorship of Agricultural Marketing and Policy.

During his year at Illinois (1963–64) Harold Breimyer advanced his competency in the economic organization of agriculture and wrote a book on the subject. His numerous subsequent articles range across the spectrum from narrow concerns with farm price and income policy to philosophical inquiries into man's ever-changing but eternally-controlling relations with his resources.

Always a prolific writer, in recent years he has set new standards in extension media for lucid yet scholarly exposition on policy topics. His monthly extension policy letter is widely read. In 1971 he with a colleague received this Association's Distinguished Extension Publication Award for co-editing of a North Central extension bulletin on bargaining.

Other awards Harold Breimyer has received are numerous: the Best Article Award of the *AJAE,* conferred three times; the USDA's Superior Service Award, twice; the USDA-AMS Certificate of Merit; the University of Missouri's Gamma Sigma Delta Senior Faculty Award; and the Centennial Award of Distinguished Service of the College of Agriculture and Home Economics of his alma mater, Ohio State University.

He served as President of the AAEA in 1969 and as Vice President in 1964.

1973 AAEA FELLOW

KENNETH H. PARSONS

Professor, University of Wisconsin
Chief, Agricultural Division, Economic Cooperation Administration, Paris, 1949–50
Head, Department of Agricultural Economics, University of Ife, Nigeria, 1968–72

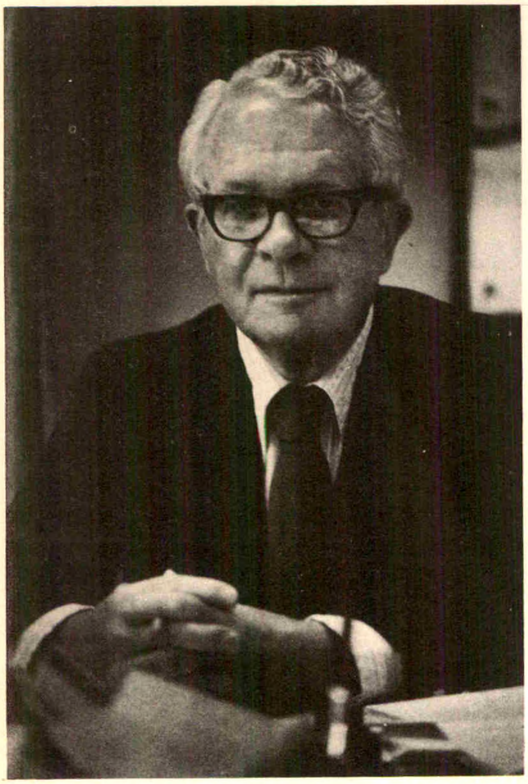
KENNETH H. PARSONS has been a life-long student of institutional economics and a pioneer in the study of economic development. His interests span philosophy and law as well as economics. He was attracted by the ideas of John R. Commons and helped Commons complete the manuscript of his last book, *The Economics of Collective Action*. He was also influenced by John Dewey in philosophy, George H. Mead in social psychology, Frank Knight in economics, and Benjamin Hibbard in agricultural economics. From this broad intellectual base came his significant insights into the methodological issues in the social sciences, as exemplified by his 1949 *JFE* article, "Logical Foundations of Economic Research." He has maintained a continuing interest in the history and development of the discipline of agricultural economics.

Following graduate studies at the USDA Graduate School, the University of Wisconsin, and the University of Chicago, he received the Ph.D. from Wisconsin in 1940. Early in his professional career, he distinguished himself by his innovative research on family farms and the family life cycle, reported in two Wisconsin bulletins coauthored with students: *Keeping the Farm in the Family* (1945) and *How Family Labor Affects Wisconsin Farming* (1950).

Kenneth Parsons was one of the first U. S. agricultural economists concerned with land tenure institutions as an important factor in economic development. He has interpreted the ideas of Commons and shown their relevance to issues in land tenure and other public policies. He was instrumental in convening the first World Land Tenure Conference at the University of Wisconsin in 1951 and is co-editor of *Land Tenure*, the proceedings of that conference. He has been active in the programs of the Land Tenure Center at Wisconsin, taking particular interest in Central America, where a number of his students carried out their research. In addition to his service with the Marshall Plan in Paris and as

Department Head in Nigeria, he had many intervening overseas assignments with AID, FAO, foundations, and other agencies, with major ones in India, the Middle East, and Korea.

Above all, Professor Parsons is a distinguished teacher. For over thirty-five years at Wisconsin he has profoundly influenced his students in both their personal and professional lives by his humane concerns, his keen intellect, his pragmatic philosophy, and his unique perceptions of new and important issues within our discipline. His students now hold important positions with international agencies, governments, and universities around the world.



1973 AAEA FELLOW

LAUREN K. SOTH

Editor of the Editorial Pages, Des Moines Register, *1954—*
Pulitzer Prize for Editorial Writing, 1956
Chairman, National Conference of Editorial Writers, 1961
Chairman, National Planning Association Agricultural Committee, presently
Author, Farm Trouble, *1957, and* An Embarrassment of Plenty, *1965*

LAUREN K. SOTH, as Editor of the Editorial Pages of the *Des Moines Register* for two decades, has applied economic principles in serving our society in a manner rarely achieved by his economics colleagues. Persistent and skillful in his economic analyses of domestic and international agricultural issues, he is highly respected among a wide range of readers upon whom he has left an indelible imprint. His contributions in popular media as well as in professional publications have been consistently characterized by clarity of expression, accuracy of analysis, and perceptive insights.

Few national farm programs and policies have escaped his always illuminating and often constructively critical editorial analysis. Repeatedly he has urged redirections in the research and extension programs of the Land Grant Colleges of Agriculture and the U. S. Department of Agriculture to keep pace with a changing agriculture. As interested observer and gentle prodder, he has provided constant stimulus for improved economics research and education.

Lauren Soth's editorials appearing in the *Des Moines Register* in 1955 won for him the coveted Pulitzer Prize for Editorial Writing in 1956. These editorials contributed materially to the initial easing of tensions between the United States and the U.S.S.R. through the exchange of farm delegations in the mid-1950's. Soth was a member of the U. S. Exchange group.

Mr. Soth has further improved appreciation of the role of agriculture in national and international perspectives through his contributions as chairman of the National Conference of Editorial Writers, chairman of the National Planning Association Agricultural Committee, a member of the Board of Directors of Resources for the Future and the Overseas Development Council, and a member of the President's National Advisory Commission on Food and Fiber. He is also active in the Des Moines Chamber of Commerce, the American Civil Liberties Union, the American Society of Newspaper Editors, and the American Agricultural Economics Association.

Born in Iowa in 1910, Mr. Soth launched upon his professional career with a B.S. in journalism and an M.S. in economics at Iowa State

University. He served in numerous professional capacities in the economics department of Iowa State University, in the U. S. Department of Agriculture, and in the Office of Price Administration before joining the staff of the *Des Moines Register* in 1947 as an editorial writer. He was named Editor of the Editorial Pages in 1954.

Mr. Soth has authored two widely read books, *Farm Trouble* (1957) and *An Embarrassment of Plenty* (1965).

PRESIDENT

AMERICAN AGRICULTURAL ECONOMICS ASSOCIATION

1973–1974

K. R. TEFERTILLER

Vice-President for Agricultural Affairs, University of Florida
Former Chairman, Department of Food and Resource Economics, University of Florida
Former Director, Center for Community and Rural Development, University of Florida
Past President, Southern Agricultural Economics Association

KENNETH R. TEFERTILLER was born in Noble, Oklahoma. After obtaining his bachelor's and master's degrees at Oklahoma State University, he served one year on the faculty. Dr. Tefertiller received his Ph.D. degree from the University of Illinois. He joined the faculty of Texas A & M University in 1959. In 1965 he was appointed Chairman of the Food and Resource Economics Department at the University of Florida. While in this capacity, he developed the Center for Community and Rural Development of the University's Institute of Food and Agricultural Sciences and served as the director during 1972–73.

Dr. Tefertiller's major areas of research have been in the economics of agricultural production and area adjustments—an early component of rural development research efforts. His writings include journal articles, experiment station publications, and other professional works. His work as an agricultural economist also included graduate and undergraduate teaching and extension.

He served as President of the Southern Agricultural Economics Association in 1971, having previously served as a member of its Editorial Board. He was Chairman of the Contributed Papers Section of the American Agricultural Economics Association in 1967–68. He served as Chairman of the University of Florida's Self-Study Committee on Organization and Administration, as a member of the Senate Committee on Professional Standards and Relations, and on many other University committees.

Dr. Tefertiller served on the National Cooperative Research and Education Committee; the National Advisory Panel for Marine Economics Research; the Special Advisory Committee to the Secretary of Agriculture for the Food and Agriculture Act of 1970; the Florida USDA Committee for Rural Development; and the USDA Evaluation Committee for Economic Research for Commercial Agriculture. He has served as consultant to the governments of Viet Nam, Ecuador, Columbia, Costa Rica, and El Salvador in developing departments of agricultural economics for the respective countries.

In 1973 he was appointed Vice-President for Agricultural Affairs at the University of Florida. He has been recently appointed Florida's administrator of Title V of the Rural Development Act of 1972.

PRESIDENTIAL ADDRESS

Rural Development in an Urban Age*

K. R. TEFERTILLER

RURAL DEVELOPMENT is not a new topic for this profession. However, it has increased in importance during recent years and has received a great deal of national attention. There are many facets of rural development and I shall not attempt to treat all dimensions of the subject. Many of the major issues are economic—and agricultural economists must accept a major responsibility in resolving them. Of course, other disciplines can and must make important contributions to the issues facing rural people [3]. I recognize the inherent limitations of taking only an economic approach to rural development problems, but this is where agricultural economists should be able to make their greatest contributions. Also, agricultural economists, by the integrative nature of the discipline, must work closely with other agricultural scientists and other social scientists.

I consider the major economic objectives of rural development to be expanding job opportunities, increasing incomes and improving the distribution of income, and providing public services and facilities to rural people. A major part of this paper will be devoted to a discussion of the need for designing programs to meet the economic development problems of rural areas. I shall distinguish between two major types of development areas found in an industrial and urban society such as that which exists in the U. S. A. or in Canada. These two types of development areas are areas with a declining population and areas with an increasing population. I have chosen for simplification to discuss these two kinds of areas as a dichotomy though, in fact, they represent two points on a continuum. The problems and opportunities for rural development vary greatly between these development areas. A part of the discussion is devoted to the economic problems faced by these areas and possible policy and program strategies for rural development in each. I shall attempt to identify some of the research and educational needs of rural areas that present challenges and opportunities to agricultural economists. And finally, I shall suggest some ways that we might organize research and educational programs within the state universities and the USDA to assist rural areas more effectively in attaining their development potentials in an "urban" age.

In taking this approach I recognize that the problems facing rural areas cannot be separated entirely from the problems of urban America. In fact, the lines that once separated urban from rural areas have become less distinct as Ed Bishop stated so well in his 1967 presidential address [1]. In recent years urban leaders have recognized that many of their problems resulted in part from the in-migration of rural people. This recognition was clearly reflected by the support of urban congressmen for the creation of regional rural development centers and for the 1972 Rural Development Act.

People are often forced out of rural areas by bleak prospects for employment and income earning opportunities or drawn to urban areas with expectations of employment. The results are often disappointing, but the people generally stay in the urban areas and become a part of the economic and social problems there. In the past we have depended heavily upon results of micro analysis of commercial units and macro income and employment policies to solve the problems of rural development. These approaches are not sufficient. They should not be replaced in our current and future efforts, but must be supplemented by community and area approaches.

We must recognize that a rural development policy has to address itself to the basic questions of where people are going to live and work in the future and under what conditions. Thus, a policy to influence the geographical distribution of population cannot be divorced from a policy to influence the geographical distribution of economic activity. Furthermore, there is a need

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* The author is indebted to B. R. Eddleman, M. R. Langham, W. W. McPherson, C. D. Covey, and M. L. Upchurch for their critical review of an earlier draft. Helpful comments were also received from several other colleagues on a later draft. I am also indebted to Mrs. Linda L. Stone and Mrs. Gwynn S. Smith for typing numerous versions of this paper.

K. R. TEFERTILLER *is Vice-President for Agricultural Affairs at the University of Florida.*

for a rational, consistent set of public policies (local, state, and federal) that focus upon the objectives of rural development stated above. As these policies are developed, there should be a clear recognition of the importance of initiating rural development programs at the local level.

Areas with Declining Populations

In some parts of the nation, the problem is to regenerate economic growth in rural areas in which the population has stabilized or declined. These rural areas may be largely supported by agricultural activity and include a trade center for rural people. In these areas the labor force is normally faced with declining employment opportunities which result in lower wages than are paid for comparable occupations elsewhere in the nation [2, p. 195] and a slower growth of wage and property income.

A basic policy issue that must be faced in declining regions is whether economic development efforts are to be concentrated in potential growth centers or dispersal of economic activity over the whole region is to be attempted. The first approach places emphasis on bringing people to jobs while the latter is directed more to bringing jobs to people.

In declining areas, growth of the trade centers probably offers the best possibility for expanded job opportunities and improved levels of public services. Scarcity of resources for development requires concentration on a limited number of more efficient locations. Agglomeration economies tend to reinforce growth in these trade centers and make concentrations of production and population more efficient than dispersal [8, 10]. Increasing returns to scale, external technological economies, and economies of scale in the supply of public services are the usual agglomeration economies in the growth centers. Growth centers have influential effects on economic activity in the areas where they are located. They can benefit people in the area by providing employment opportunities for the region's population residing within commuting distance from the center and by serving as a market for its input-supplying and primary industries [9, pp. 415–428].

At any point in time and in every region there are emerging growth centers differing greatly in size and composition which will probably develop if national economic growth and population expansion continue. Such centers are often identified "natural" as perhaps contrasted to "artificial" growth centers. If the aim of rural development policy makers is to accelerate economic growth in lagging rural areas effectively and rapidly, their task must be to identify and encourage development of these "natural" centers. Not every community in rural areas has an opportunity for economic growth, and it becomes necessary to concentrate public funds in those viable communities that are of sufficient size to have potential for sustained economic growth and that are within commuting distance of rural people. Communities with locational advantages and conditions conducive to population expansion are rational choices for such efforts.

Unfortunately, "natural" growth centers do not always exist in the midst of depressed rural areas. The growing need for primary agricultural production in the U. S. and the world may necessitate placing greater emphasis on creating "artificial" growth centers in the future for those rural areas beyond the boundary of the zone of influence of the "natural" growth centers. Many agricultural economists have had first hand experience with "artificial" centers as most of the communities in which Land Grant universities are located are of this type. Without public assistance, income levels of these rural areas may stagnate and the areas may continue to experience declines in population. Stimulation of "artificial" growth centers may be the best hope for creating employment and income earning opportunities for people in these areas. But it is time that we explicitly recognize that some areas are not desirable places in which to live, and yet we may need all the agricultural products that land resources in these areas can produce. To insure needed food production in such areas, we may have to help the areas through public assistance for at least some minimum level of social services.

The locational choices for these centers could of course affect the extent to which subsidies will be needed. The failure of these centers to grow without public investments is partly due to their lack of natural amenities to attract population. Also, less densely populated areas might not require subsidies in order to be competitive for additions in urban-type economic activities if all external social costs were imposed on private enterprise in the larger urban centers. It would not be practical to create such growth centers in all rural areas beyond the boundary of the zone of influence of the "natural" growth center. Consequently, consideration should be given to providing public assistance for depopulation of certain areas, and by this method move families to areas of greater opportunity.

Small size, and in many cases spatial remoteness, may make market subsidy a necessity both on the input and on the product side. For example, in the current petroleum shortage, there will be a strong temptation to dispose of available fuel in the heavily populated areas. Rural areas at the ends of distributional chains will probably have to be protected by some extra market scheme.

Financial inducements are often essential to encourage firms to locate in potential growth centers of rural areas. Such inducements may include grants, loans, or investment incentives favoring capital or wage subsidies, or tax write-offs. Awarding government contracts to rural areas and the construction of new government establishments in these areas are also policies that might be pursued. Public investments may be concentrated at growth centers to build up social overhead capital and infrastructure. Housing programs, transportation, and communication investments may be disproportionately focused on these centers. However, we must recognize that "artificial" centers are not likely to be successful in a free enterprise society today unless sizable public investments are made available. The great potential for the development of rural areas is likely to come from concentrating public funds in the "natural" growth centers.

Areas with Growing Populations

In parts of a nation experiencing rapid increases in population and employment, many rural communities may not be concerned with becoming growth centers because they are already tied to a rapidly growing urban center. The people in such rural communities may be primarily concerned with improving the services of the community so that it will be a better place in which to live and perhaps work. Agriculture may still be an important part of the economy, but the growth of the community in such an area is not largely dependent upon the agricultural industry. The leaders of a rural community in this case may be less interested in attracting new economic activity to the community than they are in improving the transportation and communication facilities that link their community to the nearest growth center. Through improving community services and the transportation and communication facilities that link them to the major growth areas, the community enhances its chances of retaining many of its youth even though it may be necessary for them to commute to the growth center for employment.

Although much of the U. S. and Canada is rural, it is becoming increasingly clear that we live in an "urban" age with respect to people's attitudes about the services they demand. And, unless the services of rural areas are comparable in scope and quality to the services of urban areas, people will tend to move to urban areas. Therefore, one of the most pressing problems faced by rural communities is to provide for the public service needs of its people. If the community is to grow it must also provide services for and assimilation of new residents into its labor and housing markets.

Even though we see a great many people wanting to get away from city life, in most cases they are moving to areas that are within commuting distance of a major trade center. In other words, they want the privacy and space associated with rural life with most of the convenience of urban living. In general, farm families also desire a way of life (level of services) very similar to their urban cousins. Farm youth in particular are unwilling to settle for a level of services much below their urban counterparts [5]. I think the indication is that the future of rural development in these areas is closely associated with the level of services that rural communities can offer their youth.

Policies to improve the skills of the disadvantaged worker in these areas may be just as important as in areas experiencing population declines. However, with appropriate vocational training many of these people can find employment opportunities available to them. Thus, subsidies to encourage migration will be much less an appropriate policy measure than subsidies to improve the inherent productivity of the workers themselves.

It is essential for national policy makers to recognize that a rural development policy appropriate for a rapidly growing area may be the wrong approach for a declining area. For example, public funds used to influence the location of firms in an area with declining population may successfully meet the needs of the rural people of that area. However, such a program would not be appropriate for areas where rural communities are growing because of forces beyond their control. In certain states (or parts of any specific state) there are increasing political pressures for no growth in population or in economic activity. We must recognize that environmental problems are major issues in certain areas. In these areas programs to finance improvements in rural housing, environmental quality, and public service facilities as opposed to creating new jobs may be most appropriate. Also, in the growing areas there are often serious "rural-urban fringe" problems. There is a need for coordinated planning to promote a more orderly and rational use of the community's human and natural resources.

Equalizing Employment and Income Earning Opportunities

There is no assurance that the policies to influence the location of economic activity will result in equal benefits to all people residing within the recipient rural area. Other programs to aid the disadvantaged worker, i.e., the workers with low quality skills and educational levels, will probably be needed to prevent most of the community's increased employment from being supplied by in-migration of labor, leaving many local workers unemployed. Two types of policies need consideration. One is direct investments to increase the productivity of the human agent through public subsidy of education and manpower retraining. The second is mobility assistance to many of the underemployed, unskilled, but retrainable, workers residing in these rural areas. I recognize that the income distribution problem cannot be completely solved by employment policies. In some cases, it may be necessary to combine an income maintenance program with an employment policy in order to deal adequately with the income distribution problem.

In rural areas that have experienced continual losses in population to other parts of the country, the amount of public revenues devoted to education by state and local governments is often less than needed. Also, the tax base may be declining relative to other areas, if not on an absolute basis. Because education increases the mobility of the worker, the benefits from most of these investments are obtained in other regions. Thus, rural areas with declining population may not be able to afford the same quality of education as provided by areas with growing population. In these rural areas, some type of public subsidy is warranted in order to maintain educational opportunities and insure a sufficiently high level of public investment in education [2].

These considerations also apply to the problem of vocational training of the disadvantaged adult worker. The need for vocational training for these workers is greatest in areas where employment opportunities have declined. Jobs have been lost with little prospect that demands for the specific skills of the worker will be revived in the area. Hence, incentives for firms to locate in the growth centers serving these rural labor market areas might need to be accompanied by subsidies to the firm to train and employ the disadvantaged worker.

Selective aid may be used to encourage rural people within such an area to move to a designated growth center. Such mobility assistance combined with vocational training promises an opportunity for higher wage employment for many of the underemployed rural workers. Selective subsidies for the displacement of rural people may be necessary to overcome immobility of the unskilled worker and their uncertainties of finding employment in the growth centers.

Providing Public Services and Facilities

The provision of certain public services should be concentrated in the growth center because of the major agglomeration economies associated with supplying these services. But the build up of these services also provides the basis for meeting many of the public service needs in outlying and nearby rural communities. Some examples of these needs are health facilities, educational and manpower training programs, solid waste disposal, transportation and communication facilities, sewer and water systems, fire protection, recreation, and cultural activities. As the public facilities complex and infrastructure build up in these centers, the need for public inducements to private firms may be diminished (and perhaps become unnecessary) since the infrastructure and availability of services would draw business firms to the growth center. Associated agglomeration economies that result for the private investor also lead to benefits to the areas as a whole. We should recognize the need for public policies specifically designed to give the private sector-oriented growth centers a greater outreach capacity with which to serve the surrounding rural areas. For example, public investment in transportation and communication services for the surrounding rural areas would allow rural people to make greater use of the growth center. However, there are limits to the expansion of activity at a particular growth center and there is some level of concentration of economic activity beyond which marginal social returns from public subsidy do not justify the added cost.

Another Perspective

My framework for analyzing the economic aspects of rural development may prove shortsighted in the sense that I have implicitly assumed that relative prices and farm-nonfarm income differentials will remain essentially unchanged so that present trends can be expected to continue. This assumption bears questioning because a different set of relative prices and incomes would create pressure for different kinds of technologies and institutions.

Environmental and related energy problems could drastically change relative prices. Higher prices for energy, for example, would increase the relative prices of such inputs as fertilizer and the cost of transportation, both of which could change current agricultural production patterns. The net effect may be to slow the trend toward larger production units in agriculture and lead again to greater diversification on farms. A substitution of labor for both capital and land could result.

Also, increases in the export demand for agricultural products as a result of devaluation of the dollar, increasing off-shore affluence, and increased world population suggest that the relative prices of raw agricultural products may be experiencing a long run shift due to increased demand. If so, we can expect substantial increases in agricultural land prices and pressures for those technologies and institutions that facilitate a more intensive use of land.

The implications of such changes for social institutions and rural development could stagger our imaginations here today. A greater involvement with problems of agricultural labor is suggested and would include programs for the training of agricultural labor. Development of delivery systems for housing, fringe benefits, waste management services, health care, and education for larger rural populations may also become more important [6].

The Role of the State Universities and the USDA

Universities have a major responsibility for research and extension programs in rural development and also the responsibility for adequate resident instruction programs. And they have an opportunity to give direction to these programs and to provide effective coordination of research, extension, and resident teaching programs. The direction of these programs will not be the same in each state because of variations in development problems. The Cooperative Extension Service has unique opportunities to influence the direction of rural development through its relationship with the USDA and other federal and state agencies concerned with rural development. In most states the dean or director of the Cooperative Extension Service serves as chairman of the state USDA Rural Development Committee. Many of the state committees have expanded membership to include other federal agencies such as HUD, Commerce, and HEW. Since these committees are composed of state leaders of federal and state agencies, they have the potential to influence the direction of the local rural development programs carried out by various governmental agencies. The Extension Service has an established delivery system and close ties with local community leaders that have been directly involved in development programs.

The disciplines involved and the approach depend greatly on the type of rural development problems under consideration. Small farmers and disadvantaged communities, i.e., people left behind, are considered as important parts of Title V of the 1972 Rural Development Act. Although each of these problems is likely to have economic dimensions, a quite different approach and a different set of disciplines are required to deal effectively with each problem. However, in both problem areas there is a need to determine the extent to which incomes may be low due to failure of residents to take advantage of existing opportunities or due to lack of opportunities.

The small farmer problem is largely a matter of improving family income through improved farm income or off-farm employment. Agricultural economists and other agricultural scientists constitute an appropriate team to deal with problems of small farms. But to solve the problems of small communities effectively requires a different approach, and the agricultural economist must include other disciplines in his set of co-workers. Although most of the problems of a small community are economically related, there are ample opportunities for other social scientists and professional schools to contribute to this effort. Too often agricultural economists have either become lost in the study of the organization of the community or confused by attempting to use a total interdisciplinary approach. However, the economist who wishes to discover how the space economy works cannot adhere strictly to his rigid disciplinary boundaries. He will have to assimilate within his economic framework the research of others such as other agricultural scientists, the sociologist, the economic geographer, the demographer, the transportation and regional planner, and those in law, medicine, education, and engineering.

Decision makers at the county and multicounty level are faced with important choices regarding the allocation of limited funds. What is often missing is a clearly defined set of alternatives and the likely economic and social consequences. Also, decisions in the political arena can be greatly influenced by public affairs education programs through which the general public becomes more aware of the alternatives and consequences. Most of the research programs and more of the extension programs conducted by university faculties should be carried out at the multicounty or substate level. Research and extension programs that are carried out at the multicounty level can usually, with a minimum amount of adjustment, be applied to county problems.

State universities have completed only a few thorough economic analyses for specific rural development areas. It seems that it has been easier for agricultural economists to concern themselves with organization and with defining or redefining the problem. With increased awareness of the importance of rural development at the state and federal level, it will no longer be acceptable to deal solely with problem identification and organization. It is time for some solid research and extension accomplishments by agricultural economists. State and national legislators are expecting the state universities to give rural communities assistance through providing information that will aid local decision makers in choosing from the relevant alternatives for making rural communities a better place in which to live and work. The university can and must package its expertise, technology, and research to assist rural areas in reaching social and economic goals.

It seems clear that one task of the agricultural economist is that of evaluating the cost effectiveness of various alternative public policies. This type of analysis must include environmental impact studies and a determination of the effects on income distribution. This approach could be effective in analyzing public policies (local, state, and federal) to determine their effects on the objectives of rural development stated above. Also, more research is needed on the economics of the location of economic activity. A major task in those areas experiencing declines in population is to carry out growth center analysis. The relative efficiencies of alternative growth centers need to be appraised from a systems perspective. We have gone quite a long way in perfecting some of the techniques for this type of research. The design of regional information systems, development of regional and interregional programming and interindustry analytical techniques, and the use of systems analysis all represent relatively recent professional progress. Yet, the potential for application of systems analysis to problems of evaluating alternatives for rural economies, as well as interindustry and interregional relationships, has been little exploited.

The agricultural economist has an important role to play in evaluating alternatives for providing public services and facilities to rural people. Some research is already underway to estimate production relationships for public services under conditions of alternative technology levels and quality constraints, to examine the economies of size in public service output, and to determine the economically optimum size of service districts [4, 7, 11]. More is needed.

We must assist with the development of an appropriate delivery system for providing services to rural areas [6]. Adequate response to the rural development challenge will require some difficult reordering of priorities by the Extension Service at a time when challenges from other nontraditional areas such as the environment, energy conservation, urban youth, and foreign trade also must be faced. At the same time there is an increasing need for extension programs to meet production and marketing problems facing modern agriculture in many areas of the nation. Probably the most difficult problems will come at the local level where major involvement in traditional agricultural programs over the years is difficult to change. There is a need to view agricultural programs as a part of the total rural development extension program.

Although universities are not action agencies, there is a need for a close working relationship with state and federal agencies that are responsible for action programs in rural development. Development programs are of necessity action programs, but they require research and education support. In working with such programs it becomes both more difficult and more important for universities to remain research and educational agencies.

What I have suggested is not an easy task, and it will require effective coordination between research and extension and between these two activities and the work of state and federal agencies. In my judgment, one of the most limiting factors has been our inability to organize effectively to carry out the required multidisciplinary research and extension programs. Several state universities have recently established centers for rural development to carry out the coordination of research and extension programs state-wide. It is important that Title V of the 1972 Rural Development Act be funded at an adequate level if the states are expected to carry out effective research and extension programs in rural development.

In order to be most effective, I feel that many rural development faculties will need to hold joint appointments in research and extension. Full time extension faculty tend not to become involved enough with research to appreciate its value or to influence its direction. Likewise full time research faculty tend not to become adequately involved with some of the real problems of implementing rural development programs. Some mixture of joint appointments could perhaps increase the contribution of both research and extension efforts in rural development.

Concluding Remarks

Rural development is comprehensive and the economic concepts useful for rural development are changing very fast. The relationship between economic analysis of rural areas and regional and urban planning will have to be investigated more deeply and there will need to be more cooperation between economists and planners. Many of the major problems of rural development have an economic focus and the economics discipline offers a "framework" by which an understanding of the nature of rural-urban relationships can emerge. Thus, the economists have much to offer in this era of rural development. Yet, this contribution will have its maximum effect only within the broader multidisciplinary framework where components of other agricultural and behavioral sciences are brought in to guide the focus of much of the economic analysis.

Rural development has been around for several decades and the Land Grant system has given leadership to this important effort. Due to limited funds, lack of commitment, inappropriate programs, or other reasons, we have had only limited success. It is possible that the USDA and the state universities are getting their last chance to produce. It is essential that we be successful in this effort. Agricultural economists have an unprecedented opportunity for leadership in rural development in this "urban" age. We must accept this challenge!

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INVITED ADDRESS

Conflicts and Consistencies in the Agricultural Policies of the United States and Canada

G. E. **BRANDOW**

I

WE TAKE UP the subject of agricultural policy at a time of great uncertainty as to what the future may hold. For two decades excess production capacity in agriculture has existed in both the United States and Canada. Programs to support farm prices and incomes and to limit marketings of some farm products have been in operation. Competition for export sales has been keen. As the 1970's began, Canada was struggling with surpluses of grains and dairy products. The United States in 1972 was paying farmers for withholding about 60 million acres from crop production.

The past year, however, has been so dramatic an exception to the usual situation that many observers do not expect chronic surpluses to reappear. Under the impact of poor crops in Russia and some other countries, exceptionally strong demand for meats, poor planting weather in the United States this spring, inflation throughout the world, and still other factors, surpluses have disappeared and prices have soared.

Though several elements of the situation seem temporary, some are in keeping with long term trends. Demand for meat in the affluent nations of the world is increasing strongly. Accordingly, demand for feedstuffs also is rising. The possibility that Russia may become a large net importer of food and feed is especially significant. Perhaps the green revolution in the less developed countries of the world will be less pervasive than expected a few years ago. In the United States, hopes that Western Europe and Japan can be persuaded to adopt less protectionist farm policies have created great optimism in some circles about potential export markets for the United States and, by extension, for Canada.

The past year may prove to be a turning point at which one set of circumstances in agriculture gave way to another set having greatly different effects on farm markets and strikingly different implications for agricultural policy. However, 1972–73 may prove to be a temporary aberration, as was a brief period two decades ago at the time of the Korean War. Therein lies the uncertainty, an uncertainty that any current planning for future policy must recognize. We return to that uncertainty as part of the setting for future agricultural policy at the close of this paper.

II

The broad agricultural policies of the U. S. and Canada have had much in common during the histories of the two nations. By the late 1920's, both countries had achieved a considerable development of agricultural policy in the field of research and education and at least some development in transportation, marketing, credit, cooperatives, land tenure, and land improvement. The aftermath of World War I created strong pressures for government action in another field, farm price and income support, but in both countries the measures taken in the 1920's were to strengthen cooperatives in their efforts to market farm products at higher prices. Plunging prices and extreme economic distress among farmers during the early 1930's were situations to which the governments of both countries were forced to respond in one way or another. From that time forward, "agricultural policy" usually has been taken to mean farm price and income programs, with limited emphasis on the other components of comprehensive policy.

The response in the U. S. to the great depression of the 1930's was much more sweeping and ambitious than the response in Canada. Price supports, acreage controls, direct payments, marketing orders, and export subsidies were quickly established and came to apply to a wide range of commodities. North of the border, the response emphasized the establishment of marketing boards to deal with specific commodity situations in particular areas. Government efforts to rescue the wheat pools led to support of wheat prices and later to establishment of the Canadian Wheat Board.

Dealing with the consequences of rapid tech-

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nological advance has been the principal task of farm price and income programs since World War II. In the U. S., high level price supports were in force for several leading crops during the 1950's. Export subsidies were used in varying degrees to retain commercial markets abroad. Under Public Law 480, later called Food for Peace, large amounts of wheat and smaller amounts of several other products were moved to less developed countries under highly concessional terms.

By the mid-1960's, the main outlines of present U. S. farm policy had evolved. Price supports for feed grains and cotton had been lowered to levels at which no subsidy was needed for export, and wheat export subsidies were low by past standards. Sufficient acreage was withheld from these crops to prevent overproduction in a normal year. Farmers were not compelled to withhold acreage; instead, they were offered government payments to induce them to do so. Especially for cotton and wheat, the payments were larger than necessary to obtain needed participation in the acreage control programs and thus were important supplements to growers' incomes.

Prices of milk used in manufacturing have been supported in the U. S. at fairly modest levels, but prices of milk for drinking purposes have been substantially higher under government marketing orders. Producers of meat animals, poultry, and eggs have received only sporadic, limited support through government purchases. Marketing orders for a number of fruits and vegetables probably have improved producers' incomes modestly. Since the mid-1960's, the Public Law 480 program has been less attractive to recipient countries and smaller in scope. Domestic food consumption subsidies, on the other hand, have become important, mainly in the form of more food stamps for the poor—and almost entirely at the insistence of nonfarmers.

As I read the Canadian agricultural policy of the past 25 years,[1] I find it has included most of the components already described for the U. S., but has utilized them with considerably different degrees of emphasis and thoroughness. Power to set prices and to control marketing has been given to the marketing boards to a much greater extent than has been accorded to administrators of marketing orders in the U. S. The marketing boards have been confined to provinces or smaller areas, so that their capability to influence commodities produced in several provinces and having national markets has been low. Legislation passed in 1972 created a means of getting coordinated action on a multiprovince or national basis.

Quite understandably, wheat has held the limelight in Canadian farm policy. The Wheat Board has control of delivery by farmers, transportation, storage, and sale to an extent not approached by the Commodity Credit Corporation in the U. S. On the other hand, the Board's efforts to support prices and to restrict production during the 1950's and 1960's were far less direct and ambitious than those in the U. S. Faced by low wheat prices, huge stocks, and large acreage at the end of the 1960's, the Canadian government made two important changes in wheat policy. One was a vigorous one year program to reduce output and stocks. The second was a program of making direct payments to wheat growers to bring their realized prices on a portion of their sales up to a target price. Canada now explicitly supports wheat producers' income when prices are low and has the means of directly controlling output approximately in the U. S. manner.

Barley and oats marketing in the Prairies is entirely controlled by the Wheat Board. Delivery quotas have been imposed at times, with overquota grain permitted to be sold locally for whatever it might bring. A freight subsidy on feed grains, initiated during World War II, still continues in an effort to equalize feed costs over Canada. Apparently, benefits go to livestock, dairy, and poultry producers in Eastern Canada and British Columbia and perhaps to Prairie grain producers [3]. Dairy production is subsidized heavily and in several ways: government supports prices of manufactured milk products and makes direct payments as well; milk for fresh use is priced at high levels by marketing boards; and dairymen benefit from the feed grain freight subsidy. Occasionally, low level price supports, sometimes in the form of direct payments, are used for some other farm products. Export subsidies have been in effect for certain manufactured dairy products and are used on occasion for a few other commodities. Some marketing boards dispose of products in the export market at lower than domestic prices.

Canada has done more than the U. S. to hold down program benefits going to the largest producers. Direct payments on some commodities, including wheat, have been sharply limited as to the amount going to a single grower, and the Wheat Board's advance payments on grains have likewise been limited. Not until 1971 did the U. S. restrict payments to grain and cotton producers, and then at a very high level. A further reduction will apply in 1974.

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[1] For a recent review of Canadian farm policy, see [2].

Though the agricultural policies of the U. S. and Canada have had much in common, three broad differences can be noted. The first, already suggested, is that most U. S. programs have been more ambitious than their Canadian counterparts: they have aimed at higher income objectives and have been relatively more costly to government. The dairy programs of recent years may be an exception. The second is that Canadian policy has been more fragmented: each commodity and each area has more often been treated in isolation from the others. Emphasis on marketing boards has been one aspect of this difference. The third difference is closely related to the second: U. S. farm legislation of the 1960's and 1970's constituted an effort to deal with the problem of aggregate excess capacity in agriculture more directly than has been attempted in Canada. Though the 1965 and 1970 Acts in the U. S. were written in terms of particular commodities, they provided for massive land retirement on an annual basis in a way that materially influenced acreage of other crops and of total crops; and control of crop production, though clumsy and inexact, was indirectly a restraint on livestock production.

The differences between U. S. and Canadian price and income programs can hardly be attributed to differences in types of problems encountered, for the problems have, in fact, been similar. Four hypotheses are suggested in explanation of the policy contrasts already described.

First, the U. S. is the richer nation. The U. S. has, therefore, been willing and able to put more money into its price and income programs for agriculture. The clearest example is so-called voluntary production control by which farmers are paid to reduce acreage sufficiently so that surpluses do not pile up under support prices. Less compulsion has existed in the U. S. to limit payments to large producers. The more integrated character of U. S. farm policy is partly attributable to the nation's ability to provide the money that is the grease that makes the machinery work.

The second hypothesis is that the much greater absolute size of American agriculture has frequently led the U. S. to believe it could act like the big frog in the world agricultural puddle. It once thought that it could support the price of its own cotton and—since it was by far the largest exporter—the world price as well. In this it proved to be mistaken. But in feed grains, in which the U. S. has a strong comparative advantage and is very dominant, the nation has been able to support its own and world prices at modest levels without loss of competitive position. Wheat is the principal exception, for Canada has been an equal of the U. S. in commercial export, and, as a following section shows, a duopoly-like situation often has existed.

The two remaining hypotheses probably are less important. One is that the historically weaker position of the federal government in the Canadian political system as contrasted with the American has encouraged the less centralized, less integrated policy represented by marketing boards. The final hypothesis is that geographic features more compellingly divide Canadian agriculture into distinct regions than is true south of the border. The result, again, is a more area-oriented, fragmented approach to farm price and income policy in Canada.

III

What broad conclusions can be drawn about whether the agricultural policies of the U. S. and Canada have or have not served a useful purpose? My appraisal is based principally on the American experience, but I think it applies to Canada as well. The time span is the last forty years, with emphasis on the last twenty.

If the two countries had consciously planned their agricultural development, they might reasonably have pursued two principal objectives. First would be rapid improvement of the productivity of the agricultural sector in the interests of the people at large. Second would be the alleviation of economic distress in that sector, as well as in any other, if external circumstances or rapid technological advance bore harshly upon it. This essentially is what the policies of the two countries have done, though not entirely by design. Public support of agricultural research and education, which has contributed greatly to higher productivity, was undertaken primarily to help farmers. The adverse effects of much technology on farmers, traceable mainly to the need to transfer large amounts of labor out of agriculture, were among the reasons for demands on government to support farm income. Governments in democratic societies cannot ignore such demands. Those of the U. S. and

Canada did respond, though they did not necessarily see their actions in the context of this *ex post* interpretation. The responses were often expedient, based on misconceptions of the basic problems, and inefficient in use of both farm resources and public funds, but they did provide an essential complement to the rapid introduction of new agricultural technology. The price and income programs gave an important amount of income support and stability to farming without materially impairing the adjustments most vital to agricultural efficiency, namely, labor transfer, capital investment, and farm enlargement. That is not to say, of course, that either the efforts to increase agricultural productivity or the price and income programs were without fault in the past or are well suited to the future.

Strictly agricultural policy has not been and cannot be adequate to the economic needs of all farm people and farm communities. Many of the people who left agriculture were poorly prepared by their education or skills to earn a decent living in other occupations and received little aid of any kind in finding employment elsewhere. Many people stayed in agriculture who would have left had other opportunities been more available to them. Educational and other social policies might have alleviated such difficulties and at the same time improved the situation of those remaining on farms.

Another set of problems outside the scope of farm policy is the group usually put under the heading of rural development. It seems quite likely that the socially most efficient distribution of population over the land area is now and certainly will be in the future one that puts a larger proportion of the people in some areas currently classified as rural. To the extent that development can proceed at once in such communities, the difficulties of some farm people in making a transition to other occupations will be eased. There is, of course, a much broader social gain to be made by encouraging growth in rural areas where it will prove satisfying and by improving the quality of living in rural communities generally.

The final circumstances in which agricultural policy is insufficient for the economic needs of farm people is poverty not remedial by feasible improvements in farming operations, by nonfarm employment locally, or by migration elsewhere. Some form of minimum income arrangement is needed for poverty stricken farm people, as for other people in equivalent circumstances. The transformation of commercial agriculture has proceeded to a point where its economic difficulties and rural poverty are clearly different problems with different potential solutions.

IV

What have been the interactions between the farm policies of the U. S. and Canada? Have policies conflicted, supplemented each other, or been neutral?

The most important question bearing on possible conflicts is whether the price and income policies of the U. S. have helped or hurt Canadian agriculture. The focus here is on policies of the U. S. because its price support and production control programs have been more ambitious than Canada's and because output of most commodities is considerably greater in the U. S. The general answer to this question is in two parts. First, while the U. S. supported farm prices of export products, accumulated stocks, and cut back its own production, as it did for several commodities much of the time prior to the mid-1950's, agriculture in other countries was benefited because the U. S. was holding a price umbrella over world markets and was assuming the role of residual supplier. Second, when the U. S. tried to avoid this result by using export subsidies or by reducing its domestic prices, it still put smaller amounts of products on export markets than it would have done under a *laissez-faire* policy. Accordingly, export prices available to other countries were somewhat higher than they otherwise would have been.

The first proposition is self-evident but applies mainly to policies no longer in force. The second proposition, applicable to recent years, can be illustrated with wheat. The U. S. wheat program as it has operated since 1964 includes concessional sales to less developed countries under Public Law 480, modest export subsidies most of the time (though none at present), support of domestic prices at historically low levels though above export prices, substantial reduction of output, and direct payments that both induce compliance with acreage control and augment farmers' income. Some observers look at the direct payments and at the export subsidy and conclude that the U. S. is artificially stimulating both production and exports. They also say, probably correctly, that Public Law 480 shipments are not entirely confined to noncommercial markets but infringe to some extent upon commercial exports. It seems clear, however, that if all U. S. farm programs had been discontinued a decade ago and all Public Law 480 wheat shipments had been made available to the commercial market, the U. S. would have produced more wheat than it did and would have exported larger quantities in commercial world trade.

The relationship between the U. S. and Canada in export of wheat has been uniquely complex. While surpluses existed during the 1950's and 1960's, world trade in wheat, featuring five exporters, resembled oligopolistic markets much more than purely competitive markets. McCalla [4] in 1966 narrowed this description down to an export market dominated by two countries, asserting that the U. S. and Canada played the role of duopolists. Canada, in McCalla's view, was the price leader but was greatly constrained by U. S. insistence on retaining a share of the commercial export market, which it did by adjusting its export subsidy. The Canadian Wheat Board often did not drive prices as low as unrestrained production would put them but restricted sales and invoked quotas on deliveries by producers. In more recent years, the situation has been less clear cut, and one of the other exporters, France, apparently took the lead in breaking down minimum prices established under the International Grains Arrangement. Nevertheless, the basic pattern—U. S. insistence on a share of commercial exports of roughly one fourth, considerable Canadian initiative in pricing, and informal cooperation between the two—was discernible until the strong sellers' market of the past year. The uneasy tension of conflict and cooperation that characterizes oligopoly has described the relation between the U. S. and Canada in the international wheat market.

In contrast to its international price policy in wheat, the U. S. has acted unilaterally in its pricing of feed grains. It has given significant support to world trade prices in the past decade but not enough to impair its own competitive position. Both countries have been protectionist on dairy products. Neither has been prepared to expose domestic producers to competition from such suppliers as New Zealand and Denmark; the dairy policies of the two countries have been a standoff. Neither country has intervened extensively in markets for meat animals, poultry, or their products, and barriers to trade between the countries are low to moderate.

Discussions of agricultural competition between the U. S. and Canada sometimes emphasize such matters as governmental assistance in extending credit to foreign buyers and in promoting farm products in overseas markets. The U. S. has been the more aggressive of the two in these respects in the past. The long standing preferential freight rate established by the Crowsnest Pass agreement for wheat shipped for export from the Prairies is called a subsidy by some of Canada's export rivals. Dumping of products sometimes occurs across the U. S.-Canada border. Businessmen engaged in foreign trade and particular producer groups are likely to be most aware of such aspects of competition and particularly sensitive to them.

On the whole, however, one does not find more conflict and inconsistencies between U. S. and Canadian agricultural policies than he might reasonably expect in light of the situations the two countries have confronted. Both have been faced with the political necessity of giving some aid to agriculture. Those agricultures are similar and competitive, a situation that might encourage cutthroat rivalry. Yet the more vicious forms of competition have not often appeared and have not long endured. Probably this result has been in part due to a certain regard by each country for being a good international neighbor. Perhaps more important, each nation, viewing its alternatives, frequently has judged that its own interests were best served by policies not injurious to the other.

The agricultural policies of the two countries have materially altered production and trade in certain farm products: sugar and dairy products[2] are examples found in each country. The modification of trade, however, has been greater with respect to third countries than with regard to each other. It seems doubtful that net trade between the two countries in any major farm product has been greatly altered from a pattern consistent with the principle of comparative advantage. Social costs from this source appear to be low.

V

What are the possibilities of greater harmonization of U. S. and Canadian agricultural policies in the future? If the agricultural situations in the two countries in the future are at all like those of the past, that is, with excess capacity and insistent demands for farm income programs, little support will exist in either country for abandonment of farm programs and for completely free agricultural trade between them. Only if markets are so strong that concern about prices and farm programs fades away might the full integration of the two agricultural economies win acceptance. We come back, therefore, to the sharp turn in the fortunes of agriculture in 1972 and to the uncertainty described earlier as to what the future may hold.

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[2] Both countries would have imported manufactured dairy products if they had no dairy supports or import restrictions. Despite much opinion to the contrary, it is not clear that the U. S. and Canada would have imported more than special types of cheese if *all* nations had no dairy supports and freer trade.

I claim no special insight into the adequacy of the future productive capacity of agriculture. I do think that the chances are good that surpluses will reappear in some commodities in the next few years, though probably not on the scale of the past decade. In light of inescapable uncertainties, however, we need a strategy capable of drawing forth agriculture's productive capacity should it be needed and of dealing with overcapacity should it reappear. Farm policy makers are unlikely to conclude for several years, perhaps never, that scarcity has become so much the rule that they can stop worrying about farm income support and agricultural imports.

Other considerations bearing upon farm policy may tend to reduce resistance to greater integration of U. S. and Canadian agriculture. The commercial farmers who produce the great bulk of farm products have moved up enough in the income scale so that income programs are increasingly hard to justify to the public. Farm income support may wane as a policy objective, although legislation now being enacted in the U. S. gives little indication of it. Coupled with this shift is the need to give high priority to stabilization of supplies and prices as a policy objective. Events of the last few years have dramatically illustrated the consequences of having a little too much or a little too little product for the market. As agriculture becomes more heavily capitalized, uses more nonfarm inputs, and is more closely integrated with adjacent economic sectors, it is less and less able to live with instability. A shift of priorities from income support to market stabilization does not eliminate resistance to freer trade and similar policies, but resistance should be less.

The practicable areas in which to bring U. S. and Canadian agriculture closer together apparently are those in which considerable integration already exists. The broad agricultural sector consisting of feed grains, oilseeds, meat animals, meat products, poultry, and poultry products could be integrated more fully than is now the case by establishing free trade between the two countries in feed grains and oilseeds and by assuring that tariffs on livestock and poultry products are low.

This proposal is similar to a recommendation of the Canadian Federal Task Force on Agriculture, which in 1969 completed a comprehensive study of Canada's farm policy needs for the 1970's [1]. The Task Force recommended essentially free trade in grains and abandonment of the freight subsidy on feed grain shipments within Canada. Adjustment by livestock producers in Eastern Canada to the loss of the feed freight subsidy probably would be the most difficult adjustment in either country as a result of the proposed policy change. American crop programs would clearly be the major determinant of supplies and prices of feed grains and oilseeds when the programs were in operation, as is the case now. The Canadian Wheat Board would have little reason ever to hold back on sales of feed grains and to accumulate stocks, a questionable policy for these commodities even in the past. Livestock producers in each country would have complete access to essential feed materials at world prices.

The proposed retention of modest tariffs for meat animals and poultry products is based on the expectation that Canada will not develop much export potential for these commodities. Canada should, however, be self-sufficient, and a low degree of protection to encourage this result seems likely to be in the country's best interests. The Canadian Task Force was more optimistic about potential exports of livestock products (dairy excluded) and recommended free trade for them as well as for feed crops.

It does not seem politically feasible to merge the wheat economies of the U. S. and Canada, but close coordination of wheat policies is needed. Instability is inherent in the world supply-demand situation for wheat. Neither of the world's two leading exporters can avoid assuming some responsibility for carrying stocks and supporting prices when supplies are large, as the U. S. and Canada have had to do in the past. The logic of the market situation they face will force the leading exporters into oligopoly-like behavior whenever supplies are burdensome. Perhaps this can be regularized by an international arrangement among leading exporters and importers, but past experience is not encouraging. Informal cooperation between the two countries in stabilizing the market is more likely and, as among more conventional oligopolists, the more aware the participants are of their situation, the smoother the operation is likely to be. It should be noted, however, that the oligopoly behavior envisioned here is strictly defensive and would likely be superseded by ordinary competition whenever supplies were short.

The dairy policies of the U. S. and Canada are likely to remain similar but separate. Perhaps in both countries milk produced for manufacturing uses will gradually become a smaller share of total output, and imports of manufactured products will be permitted to rise. This implies less protection for dairy producers but not necessarily more trade between the two countries in dairy products.

The fruit and vegetable sector was found by the Canadian Task Force to be one in which freer trade could and should be achieved. This judgment seems sound. The number of commodities is so great and the situations so special that a more detailed conclusion is impracticable here.

VI

The general conclusions of this survey of U. S. and Canadian agricultural policies are: (1) the policies have served important basic purposes in a dynamic world, though they often have done so crudely and inefficiently; (2) U. S. policies have been more comprehensive and have given higher priority to farm income support than have Canadian policies because of underlying differences between the two countries; (3) conflicts and inconsistencies have been frequent, but on the whole they have not greatly distorted production and trade relationships between the two countries away from patterns conforming to the principle of comparative advantage; (4) greater integration of agricultural policies and economies appears feasible, especially in areas where considerable integration already exists; and (5) prospective shifts in national agricultural policies probably will be conducive to greater integration across the border, particularly if chronic crop surpluses do not reappear.

I suspect that to many critics of the agricultural policies of the two countries, this survey will seem too complacent, too indifferent to questions of resource allocation and personal income distribution. Part of the seeming lack of concern is explainable by the survey's concentration upon possible inconsistencies between the policies of the two countries; the policies seem more open to attack for their internal effects than for their external ones. The lack of emphasis on resource allocation is partly intended, however. Most failures on this score, I think, are of the second order of importance and more apparent in static economic models than in the dynamic world that actually exists. On the question of personal income distribution, the policies of the U. S. for the last decade seem objectionable for their excessively large and avoidable transfer of income from the public to large farmers definitely in the better-off portion of the population.

If U. S. agricultural policy should now turn clearly toward modest income support and purposeful stabilization of markets, the historical record there would look fairly good. Needed improvements in Canadian agricultural policy seem to be special case ones, including, I admit, some problems like the feed freight subsidy in which resource allocation is important. But perfection in economic policy is not to be expected. Economic policy in any field is a human endeavor afflicted by the fallibilities of human beings, a fact that should be abundantly clear to those of us living in the United States at the present time.

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INVITED ADDRESS

A Canadian View of Conflicts and Consistencies in the Agricultural Policies of Canada and the United States

J. C. GILSON

EVENTS in North American Agriculture in 1973 have cast an interesting light on existing farm policies in both Canada and the United States. Agricultural policies in both countries have been so inextricably bound up over the past 40 years with concerns about low farm prices and incomes and production surpluses that it appears difficult for policy makers to cope with the present food scarcities and soaring farm prices. Until recently both Canada and the United States have concentrated their attention on ways of curtailing or managing the enormous and apparently uncontrollable productive capacity of their respective agricultural industries. Supply management, marketing quotas, land retirement schemes, food disposal programs, and price and income support programs have been the predominant features of the agricultural policies of both countries. Until a few months ago, both Canada and the United States have been strongly critical of the international trade barriers erected by many countries, particularly Western Europe, against freer trade in farm commodities.

It is ironic, indeed, that the United States, which has absorbed considerable criticism over the years because of its food disposal programs, may find it necessary to restrain or discourage food exports. The current shortage of food supplies and the growing resentment of consumers about escalating prices also confronts agricultural policy makers in Canada with some very difficult choices at the present time.

From a historical point of view, there are striking similarities between the agricultural policies of Canada and the United States. These similarities have resulted from a common set of problems, circumstances, and opportunities facing the agricultural industries of both nations. In his perceptive article, "Agricultural Policy in an Affluent Society" [11], Ruttan's analysis of the forces and conditions which shaped agricultural policy in the United States can be extended to the Canadian situation. The abundance of free land, the relative scarcity of labor, and the underlying desire of farmers in both countries for freedom and independence led to parallel developments in such areas as land settlement and tenure policies, research and extension programs, and credit policies. The market linkages between the agricultural industry and the national economy (markets relating to farm products, inputs and capital, labor, land, and consumer goods) were the focal points for public policies designed to modify market behaviour when it became apparent that the prevailing market relationships were not yielding the type of resource allocation or income distribution effects desired by farmers. Policies relating to price stabilization, income support, producer bargaining power, market regulation, and rural poverty tended to emerge from common problems and concerns in both countries. It is not surprising that farm organizations, producer cooperatives, and rural legislators in both Canada and the United States shared similar philosophies and objectives.

But there have also been striking differences between the two countries insofar as agricultural policy is concerned—differences attributable to basic dissimilarities in forms of government, wealth, size, geography, and cultural-linguistic traditions. Perhaps we could illustrate the impact of these differences on agricultural policy by looking in more depth at some examples.

While the governments in both Canada and the United States are based on a form of federalism—a dual form of government designed to distribute power and authority between the central government on one hand and the state or provincial governments on the other—the constitutions of both countries are, at the same time, fundamentally different.

In the Constitution of the United States, the states "were to exercise such authority as was not specifically granted to the central govern-

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ment, expressly prohibited to the states, or withdrawn from the reach of all governments" [3, p 97]. From the beginning the framers of the Canadian Constitution intended the central government to have greater authority in relation to economic life than the federal government in the United States. Accordingly, the Canadian Constitution granted to the federal government all powers (residual) which were not explicitly given to the provinces. It should be noted, however, that section 95 of the Canadian Constitution gives both the federal government and the provinces concurrent jurisdiction over agriculture, which explains why both levels of government are so heavily involved in marketing board legislation. Section 93 of the Constitution gives the provinces exclusive jurisdiction over education, a power which has prevented the federal government from becoming involved in agricultural extension programs, a distinct contrast with the United States where the federal government has been heavily engaged in agricultural extension programs and policies.

Another matter which must be recognized in any analysis of Canadian-American relations has been described by Professor Harry Johnson as the "Canadian Quandry" [8]. The current debate on Canadian nationalism is based partly on an identity crisis and partly on the desire for greater economic, social, and political independence. The issues involve such areas as agriculture, football franchises, radio and television broadcasting, water exports, book publishing, oil and gas exports, research, labor unions, and foreign investment.[1] Any discussion of agricultural policy in Canada must be seen in the context of this general debate. Suggestions relating to greater continental integration of resources between Canada and the United States will be treated by Canadian policy makers with much more circumspection than has hitherto been the case. At the same time, the high degree of economic interdependence between the two countries cannot be ignored. This is the essence of the "Canadian Quandry."

Professor Fowke has argued that Canadian agricultural policy has no degree of permanence or internal consistency because of the lack of a recognizable conceptual framework for the policy [4]. By contrast, he contends that agricultural policy in the United States has had a unifying force and an underlying consistency because it has been based on more clearly articulated objectives and conceptual foundations. Brancow does not appear nearly as confident as Fowke about the internal consistency of American farm policy [1].

I agree in general with Professor Fowke's thesis that there has been no explicit and no clearly recognizable conceptual framework for the development of agricultural policy in Canada. However, there has been an underlying evolution in Canadian farm policy developments which must be recognized if farm policy in Canada is to be understood.

The family farm concept in Canada emerged from a national policy devoted originally to the settlement of Western Canada, partly for military and defense purposes and partly for the benefit of commercial and industrial interests in the East. It is doubtful that the Homestead Act passed in 1872 had as its primary purpose the development of family farms on the Prairies. Eventually, however, the importance of the family farm as an objective of Canadian agricultural policy did emerge and, in later years, many farm policies and programs were shaped accordingly.

The evolution of Canada's agricultural marketing and pricing policies has been a much more complex and subtle process. One will not find a neat conceptual explanation for the development of the Canadian Wheat Board, the Agricultural Stabilization Act, or the various commodity marketing boards. These policies resulted from a long series of incremental reactions and adjustments to changing events and circumstances over the past half century. The evolution of events in Canada's grain industry will illustrate the philosophy which has developed over time with respect to Canada's more general marketing and pricing policies.

At the turn of the present century, Western Canadian farmers were making repeated protests about the monopolistic powers of the railways and the grain trade. The economic liberalism of the federal government at that time dictated that any price and marketing policies for agriculture should be as consistent as possible with the unfettered operation of a free enterprise, competitive market system. Accordingly, two basic approaches were followed by the federal government for nearly two decades in dealing with the grain producers' problems: development of regulatory measures such as the Manitoba Grain Act passed in 1900 and the Canada Grain Act passed in 1912, and the development of combines investigation legislation in Acts passed in 1910 and 1923. The underlying philosophy of the combines legislation was that control of monopolistic business practices could best be achieved by investigation and appropriate publicity.

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[1] See, for example, [9, 10].

Unhappy with the federal government's reluctance to intervene more directly in the market place, grain farmers in Western Canada turned to the development of their own power in the market place. A number of producer cooperatives were developed to provide the grain producer with greater bargaining power. Up until 1920 it is interesting to note that the grain producers' cooperatives quickly adjusted to the free enterprise system.

For the first time in the 1920's, however, a significant number of grain producers began to question the value of the open market system [4, ch. 10]. A clamour began for the introduction of a state marketing agency. When the federal government continued to resist the grain growers' attempt to remove the open market system, the farmers turned to a more aggressive form of cooperative marketing organizations. This was the beginning of the wheat pool movement in Western Canada.

During the early phases of the wheat pool movement, grain producers concentrated their attention on the reduction of marketing margins. Later, however, the grain producers became more concerned with the idea of influencing prices in the ultimate selling market. Inspired by the organizing genius of Aaron Sapiro, the ardent advocate of compulsory pooling and centralized forms of cooperatives, the wheat pools made a concentrated effort to influence grain prices in the ultimate market. Through their Central Selling Agency, the wheat pools became heavily involved in the direct selling of wheat in world markets. The collapse of market values and the difficulty of selling wheat during the latter part of the 1920's created a financial crisis for the wheat pools. The pools' Central Selling Agency was placed under the control and management of the federal government.

The Canadian Wheat Board was established in 1935, not as an exclusive agency for the marketing of prairie wheat, but as an alternative to the open market system. It was not until 1943 that the open market method of selling wheat was abolished and the Wheat Board became the sole agency for wheat marketing in the Prairies. In 1948 oats and barley were also placed under the jurisdiction of the Wheat Board.

While the grain growers in the Prairie Provinces were preoccupied with events which led up to the establishment of the Canadian Wheat Board in 1935, other agricultural producers in Canada were experimenting with various types of marketing organizations. The experience of the fruit growers and the dairy and poultry producers was similar in many respects to that of the Prairie grain producers. These commodity groups started out to develop voluntary forms of cooperative marketing organizations. Dissatisfied with their inability to influence prices, these commodity groups turned to compulsory forms of marketing agencies. After several attempts to develop compulsory marketing boards at the provincial level, the producers turned their attention to the federal government. The Natural Products Marketing Act was passed by the federal government in 1934. The Act was declared *ultra vires* in 1937 on the basis that the federal legislation interfered with property and civil rights in the province.

In 1949 the federal government passed the Agricultural Products Marketing Act which in essence extended the same powers that a producer marketing board had under provincial legislation within the province to the interprovincial and export markets. In 1972 the federal government passed the Farm Products Marketing Agencies Act, the primary objective of which was to provide national enabling legislation which would assist in bringing about greater coordination among particular commodity groups in the various provinces. At the present time there are nearly one hundred agricultural producer marketing boards in Canada.

Even while agricultural producers were working on the development of commodity marketing boards during the past forty years, the possibility of more direct government involvement in price and income support programs was not ignored by Canadian farmers. The first tangible step in this direction was the passing of the Agricultural Prices Support Act in 1944 by the federal government. Two methods of supporting prices were provided for under the Act: (1) direct price payments were to be made to producers whenever the market price fell below some designated support price and (2) the Board had the power to buy any designated agricultural product at a defined price. The Agricultural Prices Support Act did not contain any formula for the attainment of the level of price supports for any particular commodity. In general, the federal government was reluctant to establish "incentive" prices under the Act. For the most part the Act was used to stabilize prices under extreme conditions.

For the first time, in 1955 the Canadian Federation of Agriculture proposed a form of parity price. The federal government remained reluctant to use a rigid formula for the setting of floor prices under the Act. By 1957 the case for some form of formula pricing as a feature of price supports became a very contentious issue. In 1958 the Prices Support Act was replaced by the Agricultural Stabilization Act. Price supports under the Act were to be based on a minimum of 80 percent of the moving average prevailing during the preceding ten years. Both direct price payments to producers and purchase of commodities at a designated price by the federal government can be used under the Act to support prices to producers.

Starting with the Agricultural Adjustment Act of 1933, the United States has made a much more direct and aggressive effort to maintain farm prices and incomes than has been the case in Canada. With variations in emphasis and approach, it has been observed that many of the basic features of the 1933 farm legislation have been continued up to the present time [12, p. 88]. A recent article suggests that if Henry Wallace, Roosevelt's Secretary of Agriculture, were to return to his old department he would not find many changes in U. S. farm legislation [2].

Three distinct and yet clearly related approaches have been used in the United States to support farm income: (1) direct price supports—prices were supported during the early phases of the program by government nonrecourse loans, purchase, storage, and disposal programs; (2) supply management—farmers have been induced to take land out of production voluntarily in return for federal payments, or they have been compelled to do so through stiff penalties imposed for violation of output restrictions, stated as quotas and allotments; and (3) direct income supplement payments were made [2].

During the first 20 years of the farm program in the U. S. considerable emphasis was placed on high price supports propped up by government loan, purchase, and storage programs. The result at the end of the period was a massive accumulation of government owned farm commodities, partly because of generally ineffective acreage control programs.

During the Benson era in the 1950's, an attempt was made to lessen the dependence of agriculture on government support. This attempt, however, was only partly successful because of deeply rooted congressional opposition [6]. Two significant farm programs were introduced during that decade to help reduce the accumulation of surplus stocks: the Agricultural Trade Development and Assistance Act of 1954, better known as Public Law 480, and the Soil Bank Legislation of 1956.

During the Kennedy era of the early 1960's, an attempt was made to use supply management as the means of maintaining high price supports. The strong farm opposition to supply management persuaded the government to turn to massive land retirement, direct payments to farmers to induce them to withhold acreage from production, and continuation of the wheat marketing certificate program. The Agricultural Act of 1970 was an attempt to move towards a freer farm economy with greater emphasis on direct income payments where necessary to supplement farm income. It is also interesting to note that the 1970 Act contained a provision which limited the payment ceiling to $55,000 to any individual producer.

Several significant differences between Canadian and U. S. farm policies may be noted. U. S. farm policy has placed a great deal more emphasis on direct support of prices and incomes. By contrast, Canadian price policies have been generally limited to price stabilization measures. A notable exception has been the Canadian dairy policy. Farm policies in the U. S. have been much more ambitious and much more costly to government than has been the case in Canada [7]. Canadian farm policies have been much more commodity oriented than in the U. S., in large part because of the influence of the commodity marketing board legislation. It appears also that Canadian farm policies have generally been much more restrictive in terms of the benefits which could be derived by any one producer. The marketing quotas of the Canadian Wheat Board, the restriction on size of loans permitted under government credit legislation, and the maximum limits placed on payments made under price support legislation have traditionally been aimed at the smaller family farm. In the U. S., by contrast, limits where they have existed have been far less restrictive. In many respects, this difference will explain the general reluctance of agribusiness to become involved in the production side of the Canadian agricultural industry while large-scale commercial investment has not been uncommon in the American agricultural industry.

The relationship between Canada and the United States on agricultural matters has been remarkably harmonious, but there have been significant exceptions. During the 1950's and 1960's, for example, both countries have had strong differences of opinion in the wheat export market. Canadian farmers were alarmed about the subsidized sales of wheat from the U. S. under Public Law 480 during the mid-fifties, while American farmers found it difficult during the 1960's to reconcile their production control programs with Canada's unrestricted sales of wheat to China and Russia. In 1967 Canadian officials were very disturbed about the decline in wheat prices, the main cause of which many attributed to U. S. marketing policies. The recent controls imposed on the export of soybeans from the U. S. to Canada has created widespread perturbations in the Canadian feed processing and livestock industry.

The high state of uncertainty facing the agricultural industries of both Canada and the United States makes it difficult to predict what changes may be made in farm policy for the future. There appear to be signs, however, that the U. S. government would like to see the agricultural industry become more free market oriented [2]. The present prosperity in agriculture coupled with the growing concern of American consumers about high food prices may provide the present Administration with the opportunity of eliminating certain costly farm programs which former Agricultural Secretary Benson found impossible to do during the 1950's. At the same time, it is difficult to believe that the U. S. government would not retain some minimum form of floor price for certain basic commodities and certain of the land withdrawal programs in the event that surpluses reappear at some time in the future. The alternative might be a greater reliance on free prices to regulate demand and supply with the provision for direct income payment supplements when this is regarded desirable for economic or social reasons [5].

In Canada there is likely to be a continuing effort to develop some form of price and income stabilization program for Prairie grains. There are signs that greater pressure will be placed on the federal government to develop a more effective price support program under the Agricultural Stabilization Act. The impact of the 1972 Farm Products Marketing Agencies Act on the development of a coordinated national approach to commodity marketing boards remains to be seen. If the national marketing legislation does become an effective instrument for greater coordination among the provinces, we can anticipate a much more aggressive use of supply management for several commodities, particularly poultry and eggs. A vote to be taken later this year among rapeseed and flaxseed producers will determine whether these two commodities will continue to be sold on the open market or brought under the jurisdiction of the Canadian Wheat Board. If the latter alternative is chosen, this could bring to an end the free market system of grain marketing in western Canada.

It could be that the United States, after forty years of heavy government involvement in agriculture, will turn to a greater free market oriented farm policy, while Canada's agricultural industry will be headed towards a greater degree of government intervention and control through marketing board legislation. This switch in policies, if it occurs, will not only be interesting in itself but could have serious implications for the Canadian agricultural industry.

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Sectional Meeting B

GRAIN MARKETING METHODS IN CANADA AND THE UNITED STATES

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Grain Marketing Methods in Canada—The Theory, Assumptions, and Approach*

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LIKE ALL my fellow participants, I find myself severely limited by time in relation to the scope of this paper. I propose therefore to deal with an important historical period in brief summary form.

Manitoba became a province in 1870. The Canadian Pacific Railway reached Winnipeg in 1885. By building from both sides of the continent, the railway reached across Canada the same year. It was not until a decade later that settlement in the Canadian West reached major proportions. "After 1896 people poured into the West as they had poured into Upper Canada sixty years earlier. The railroad had provided them with easy access to the prairies, but settlement pushed rapidly into the back country and railway lines followed population as well as preceded it" [4, p. 240]. So stated Mary Quayle Innis. She further observed that between 1896 and 1913 nearly one million settlers came to the Canadian West from the United States. Other thousands had come from the United Kingdom and Continental Europe. By 1911 the population of the Prairie Provinces was estimated at 1,326,000.

The Prairie Provinces were well developed agriculturally by 1930, and urban development was considerable. Population had reached 2,354,000. In terms of cereals and oilseeds, the seeded acreage in 1930 was 38.9 million acres. The corresponding statistic for 1972 was 42.7 million acres. By 1929 the first of a succession of wheat crises in the Prairie Provinces was on its way as the depression of 1929–30 and ensuing years brought the whole Canadian economy to near collapse.

Two developments within the settlement years had long term effects upon marketing policy. Among the hundreds of thousands of people who pioneered the West were hardy and resourceful individuals who not only developed the agricultural industry but led movements to correct abuses and exploitation, particularly in the marketing of annual grain crops. The tool for reform was a particularly militant form of cooperative effort which took root in each of the Prairie Provinces.

The second event of the earlier days of the Prairies was the tragic interlude of World War I. During the greater part of the war, the open market continued to function in spite of the fact that buying for the Allied countries became highly concentrated. However, by June 1917 it became clear to the government of the day that a policy change was necessary. The government sought control of the wheat market to prevent "to the utmost possible extent any undue inflation or depreciation of values by speculation, by hoarding of grain supplies, or by any other means" [3, p. 569]. The instrument to accomplish these ends was the Board of Grain Supervisors. The Board functioned from June 11, 1917, to July 21, 1919. It was a monopoly Board and, in effect, operated as the intermediary between producers and the Wheat Export Company by buying for Allied governments. There was no future trading in wheat during the operative period of the Board. After a hiatus of 10 days, a new organization entitled the Canadian Wheat Board was formed to handle the

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* The author wishes to acknowledge the assistance received from his colleague, Mr. Clive B. Davidson, whose personal involvement in many capacities in the Canadian grain industry extends virtually over a half century. Also the author has quoted the late Bill Grindley, a very competent agricultural economist who served this country well and in many capacities.

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balance of the 1918 crop and 1919 deliveries from producers. The Canadian Wheat Board was also a Monopoly Board.

Much of this early history is described in detail in an article by T. W. Grindley [3]. Dr. Grindley pointed out that the 1917 Board of Grain Supervisors was established because the open market was not judged competent to deal with centralized government buying. The 1919 Wheat Board was appointed because it did not appear that this centralized and organized buying would exist in 1919–20 or any open and stable market of the character obtained prior to the war.

Dr. Grindley observed that trading in wheat futures was started again in the fall of 1920, but wheat prices suffered in the general price deflation which began soon thereafter. He quite rightly observed that the high prices of the 1917–20 period were associated by many farmers with the method of marketing through Government Boards. This view was expressed to the Royal Grain Inquiry Commission, hearing evidence in Western Canada in 1937, nearly twenty years afterwards.

The militant farm organizations did not willingly accept de-control. They wanted a continuance of Wheat Board marketing. Organized farmers expressed little or no confidence in the open market. Before the war they worked to improve the existing system. After the war they sought to replace it.

An Act was passed during the 1920 Parliamentary session providing for a Wheat Board. But later in the year, the Government announced that there would be no government operation in 1920–21 because of the discontinuance of centralized buying. Much was made of the fact that in 1920–21 prices were declining and the best prices received by farmers were those on grain sales following harvest. It was pointed out that on a falling market a Wheat Board average price would not have been attractive.

The agitation of organized farmers for an operating Wheat Board continued, but increased attention was given to the legality of such a board in peace time. In 1922, influenced in part by the legal aspects of the case, Parliament passed enabling legislation for the establishment of a Wheat Board, but concurrent legislation was required in at least two of the three Prairie Provinces before the legislation could become effective. Saskatchewan and Alberta passed the necessary provincial legislation, but the provincial legislation was rejected in Manitoba. The Wheat Board could have operated, but the Federal and provincial governments argued that they could not find men competent to run the Board. I have never placed much credence in this explanation. Perhaps it was rather the fear that deflation had not yet run its course that deterred people from accepting complex management responsibilities.

Militant farm groups were not going back to full dependency upon the open market without a struggle. As an alternative they went back to their cooperatives as a base for grain handling and merchandising. They would try to do the job themselves.

I would like to interject here that history has had a great deal to do with grain marketing in Western Canada. Farmers who expressed themselves through their organizations had their own ideas as to how grain should be marketed and this fact became a political reality. The agrarian choice was made in the early part of the century. Its dominance today is everywhere in evidence.

The Pooling Era

The Alberta Cooperative Wheat Producers Ltd. began handling and selling wheat for its members in 1923, followed by the Saskatchewan and Manitoba Pool Organizations in 1924. In the same year there was agreement to delegate selling operations to a Central Selling Agency, officially known as Canadian Cooperative Wheat Producers Ltd. The Cooperative elevator companies, supporting the pooling concept, thus became part of a larger grain merchandising enterprise.

The Pools were able to negotiate their own financial requirements with the commercial banks. They operated on the basis of an initial payment to producers at the time of delivery and further payments or payment as grain was sold or when Pool Accounts were closed. This was the financial structure utilized by the 1919 Wheat Board and subsequent Wheat Board legislation.

The fixing of the initial payment to producers was one of the key factors in Pool operations. Good management and the judgement of bankers were on the side of conservatism in fixing initial payments. Pulling in the other direction was the desire of Pool directors to attract as much business as possible and this meant some limitation between the level of initial payments and market prices available to non-Pool deliveries. The establishment of initial payments represented risk to the Pools. There was a lively awareness of this risk.

Supporters of the Pools could justly claim a considerable measure of success in handling the grain crops of 1924, 1925, 1926, 1927, and the record crop of 1928. In merchandising wheat and other grains, the Central used the futures market, sold to exporters and shippers, and established agents of its own in certain markets.

From Crisis to Catastrophe

In the crop year 1929–30, the Pools established an initial payment basis No. 1 Northern of $1.00 per bushel. This initial payment level was established on July 11, 1929, when the market stood at over $1.70 per bushel. No sooner had the crop year 1929–30 started than serious price instability asserted itself. On August 1, 1929, the October future was quoted at $1.70⅝ per bushel. On August 6 the same future closed at $1.54⅝, a decline of 16 cents per bushel in the first week of the crop year. This was only the start of a market decline which was to bring market prices close to the Pools' initial payment of $1.00 per bushel, and the Pools were in financial trouble in January and early February 1930.

Representatives of the three Prairie Wheat Pools met with the Prairie provincial governments to discuss the marketing situation. If the Pools were forced to liquidate stocks to meet the claims of the banks, the immediate effect upon prices would be disastrous. No one would gain, not even the banks. It was to prevent a debacle of this kind from developing that the governments of Manitoba, Saskatchewan, and Alberta agreed to guarantee the bank loans of the Pools as from February 6, 1930.

It must be said that the action of the provinces was well received throughout Canada. It was the general view that recovery was overdue and the action taken by the provincial governments would go a long way to restore confidence in the wheat market and economic conditions generally. But the market paid little attention to words of optimism. The market fell to a level of about $1.00 per bushel strengthening slightly during the balance of the crop year 1929–30.

A new problem arose with the crop year 1930–31. With very limited financial reserves and, in debt to the Provincial governments, the Pools nevertheless had to face the new marketing year commencing on August 1, 1930. The basic question was how were the Pools to finance operations in respect to the 1930 crop. The lending banks were reluctant to commit themselves after the experience of the past year. The maturing of the 1930 grain crops finally made the matter of reaching decisions one of great urgency.

With the market price of wheat at 90 cents per bushel, the Pools decided that they could operate on the basis of an initial payment of 60 cents per bushel basis No. 1 Northern in store Fort William/Port Arthur or Vancouver. But, money was still required. Several meetings were held between the Pools and the banks, the Pools and representatives of provincial governments, and with the Prime Minister elect, the Honourable R. B. Bennett. It was finally decided that the Pools should operate on the basis of a 60 cents initial payment and a 15 percent margin. Market prices went into another decline, forcing a reduction in the initial payment level, first to 55 cents per bushel and later to 50 cents per bushel. By November, the Pools were again in financial trouble. Their debts to the provincial governments had not been resolved and their margins were about to be impaired in respect to the 1930 Pool Accounts. The banks were insistent on a change in Pool management. The only hope of assistance now lay with the Federal government. The Federal government was quite sympathetic to the western position and committed itself to assist with pool financing. This assistance was combined with new management for the Central Selling Agency.

These events of 1929 and 1930 heralded the re-entrance of government into the wheat marketing process after an absence of some 10 years.

Stabilization

Once in the driver's seat again, the Federal government demonstrated faith in the futures market as a marketing mechanism and, as an interim policy embarked upon a market stabilization program through the agency of the Central Selling Agency under its new management of Mr. McFarland. In spite of market support given generously at certain times of the year and the fact that substantial quantities of wheat had been taken off the market by the government, recovery was discouragingly slow. The low point of grain prices was not reached until 1932 and from this point in time recovery was slow indeed.

Stabilization, conducted through the Central

Selling Agency, was subject to a great deal of criticism. Criticism was directed not so much at the objectives of the program as at the means employed and the lack of adequate accounting for public funds involved. With some improvement in the grain position noticeable by 1934 and with a Federal election likely in 1935, plans were made for the establishment of the Wheat Board to take over government holdings at some specific date and be ready to participate in the marketing of the 1935 grain crop.

It should be observed that during the long and frustrating years of the stabilization exercise, Mr. McFarland and the power centre of the Federal government had lost faith in the futures market as a permanent part of the Canadian Wheat Marketing structure. It was this change in attitude which had much to do with their support of the Wheat Board concept in 1935.

Actual legislation was introduced on June 10, 1935, and referred to a Special Committee of the House. Hearings began on June 18, 1930. The Bill referred to the Committee provided for a monopoly Board. In Committee the Bill was amended to provide for a voluntary Board with some stronger powers in reserve which could be brought into effect by Orders-in-Council. In Parliament and in Committee the Parliamentary opposition strongly opposed compulsion in grain marketing and with time running out for the government, the opposition won a clear-cut victory on this issue. Thus, a delivery option was left for producers under the new legislation.

A New Government and a New Approach

In 1935 there was a change of government in Canada with the opposition becoming the government. This meant, in the short run at least, a change of attitude toward the involvement of government in the grain marketing process.

Early in the 1935–36 crop year, the personnel of the Wheat Board was changed. In 1936 the demand for wheat increased sharply as did market prices. As a result the 1935 wheat crop, a small one, and accumulated stocks moved into commercial channels at home and abroad at a rapid rate. The Canadian wheat carry-over was substantially reduced by July 31, 1936.

When it came to fixing the initial payment level for the 1936–37 crop year, the federal government made a unique decision. The initial payment was continued at 87½ cents per bushel,[1] but with the reservation that the Wheat Board would be operative in respect to the 1936 crop only if market prices fell below 90 cents per bushel. This represented an ingenious use of the Wheat Board legislation; the producer was assured of the minimum price provided by the Wheat Board's initial payment. At the same time, the flow of grain was directed to the private trade under the price conditions described. The 1936 and 1937 wheat crops, both small ones, were marketed in this manner. This was an illustration of the Wheat Board in a "fire department" role.

This view of the Wheat Board was strengthened by the Report of the Royal Grain Inquiry Commission which had been established in 1936. In a report which did not lack intelligent effort, the private trade and the futures market were endorsed as providing the best long term marketing organization for western wheat. The Commission,[2] on the basis of evidence submitted to it and its own studies, found certain disadvantages in a government Board. In his report, the Commissioner stated:

> For all these reasons (and notwithstanding the adverse considerations to which I have referred in relation to government Boards) I do not feel that I can suggest the immediate dissolution of the Canadian Wheat Board. There is a strong possibility that conditions may develop which will require a measure of assistance in the marketing of the coming crop, and I do not know, of course, how long these conditions may continue after the final chapter of this report is written. In the meantime I can think of nothing better to suggest than that the Board be maintained to meet any situation which may arise [3, p. 579].

As evidence that the Government of the day accepted the recommendations of the Royal Grain Inquiry Commission, reference can be made to the 1939 legislation passed by Parliament. Three Bills were introduced, one by the Minister of Trade and Commerce and two by the Minister of Agriculture. The first Bill was to provide for the regulation of trading in grain futures on the Winnipeg Grain Exchange. The second and third Bills were to provide for financial guarantees to cooperatives undertaking the marketing of grain and for measures to assist farmers experiencing crop losses or failure. The first two measures were in implementation of the report of the Royal Inquiry Commission and the third measure was directed toward easing the hazardous yield position in the Prairie

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[1] Basis No. 1 Northern wheat in store Fort William or Vancouver.

[2] The Royal Grain Inquiry Commission consisted of a single Commissioner, Mr. Justice Turgeon.

Provinces and financial situations which could not be cured by price alone, nor by any marketing organization.

The purpose of the cooperative legislation was to provide an alternative to the Wheat Board concept as recommended by the Commission. The legislation in regard to regulation of futures trading and cooperative marketing as applied to wheat has never been implemented as the war and subsequent events greatly strengthened the role of the Canadian Wheat Board. The Report of the Royal Grain Inquiry Commission had simply become a matter of history in a few short years.

Early in 1938 it was realized that the factors which had strengthened the wheat market, a series of small crops in Canada and elsewhere, had run their course, and indications for 1938 were for more abundant supplies and sharply lower prices. An initial payment of 80 cents per bushel was authorized and the Wheat Board was actively concerned with the marketing of the wheat crop of Western Canada. Both the Wheat Board and the government were aware that the 80 cents per bushel initial payment level was above the price which most likely could be realized from 1938–39 deliveries to the Board. The initial payment constituted a planned subsidy to the producer after a series of below average yields. In the long history of the Wheat Board this was one of the few occasions when initial payments were not based upon commercial considerations.

World War II

With the outbreak of war in 1939 the Canadian government hastened to assure the world that no changes were contemplated in the Canadian wheat marketing organization and that, specifically, the futures market would continue in operation. World War II did much to improve the relationships between the Canadian Wheat Board as an institution and the government of the day. Wartime requires national controls of many kinds and the Wheat Board proved itself as an able administrator of Wartime Control measures.

The greatest expansion in Wartime activities for the Board came in September 1943 when the government revised its wheat policies. The immediate crisis arose when a rise in wheat prices threatened price control regulations at a critical stage of the war. On September 27, 1943, a day of some historical importance, the Canadian Government announced an important change in wheat policy. The new policy involved the following actions. Trading in wheat futures contracts was suspended. The Canadian Wheat Board was authorized to take over all off-farm wheat stocks to be used for Mutual Aid purposes or for subsidized domestic use. Prices to producers were adjusted upward to $1.25 per bushel basis No. 1 Northern wheat in store Fort William/Port Arthur or Vancouver [2, p. 3]. In a move prepared in the greatest secrecy, the voluntary Wheat Board of 1935 became the compulsory Board of 1943 as a wartime measure.

With the military gains of 1943 and later years, the needs for surplus wheat became larger and more urgent. Canadian wheat was the nearest at hand and thus started an export flow which was to last with varying degrees of intensity until about 1950. On July 31, 1946, the five year Anglo-Canadian Wheat Agreement was announced. This agreement was intended to give Canada market and price assurance, and the United Kingdom supply and price assurance in the five year period following World War II. The Wheat Board became the administrator of the Canadian side of this agreement.

Apart from the supplying of wheat for needy populations, the most interesting postwar marketing development was the revision of the Canadian Wheat Board Act to provide the Board with powers which it had been exercising under the War Measures Act. The peacetime Act was redrafted to continue the monopoly position of the Wheat Board. This was the most important feature of the 1947 revision of the Canadian Wheat Board Act. One of the arguments used for the continuation of the monopoly powers of the Board was the fact that such a Board was needed to administer a treaty—the Anglo-Canadian Wheat Agreement.

In 1949, in response to producer requests, the government agreed that oats and barley should be brought under the Board subject to referenda in the provinces. Votes were held, producers approved, and the powers of the Wheat Board were extended to oats and barley.

The first International Wheat Agreement was signed in 1949. Canada had been a persistent advocate of such an agreement and became a vigorous supporter of the first and subsequent wheat agreements. In fact successive international wheat agreements became very much involved in Canadian wheat policy. It was only natural that the Wheat Board should represent the Canadian government in the administration of wheat agreements in effect from 1949 through 1969. Canada supported and observed without reservations the terms of successive wheat agreements with respect to minimum and maximum prices.

Thus the Wheat Board early in the post World War II period was endowed with unprecedented powers in the marketing field, a reputation for administrative competence, and the general support of the farming community of the West. These elements of strength were to be needed in the years ahead.

The Surplus Era

The times of international shortage quickly turned into a prolonged period of international wheat surpluses. Between July 31, 1952, and July 31, 1954, year end stocks of wheat increased by about 400 million bushels to a total of 600 million bushels, a very large year end stock of Canadian wheat at this point in time. This was the start of an era of wheat surpluses which was to last a full sixteen years to the crisis of 1967–68 and another 3 or 4 years after the crisis, a period of 20 years in all. This was a long time in the history of the grain industry of the Prairie Provinces and an important part of the working years of one generation of wheat producers. Attitudes were shaped which are still with us.

Let me be more specific about these twenty years of surpluses. The arithmetic is simple. Year end stocks averaged 600 million bushels. Average stocks of this magnitude meant in effect that over the years available wheat supplies after adding in annual crops amounted to well over 1 billion bushels: the actual 20 year annual average was 1.129 million bushels. Against wheat supplies of this magnitude exports of wheat and flour averaged 371 million bushels, while domestic use on an average annual basis was 157 million bushels. Average annual disposition was therefore some 528 million bushels or less than one half of average annual availability of wheat for the 20 year period under review. In 15 of the 20 years wheat stocks exceeded elevator capacity available and substantial stocks remained on farms at year ends.

Strangely, for the greater part of the "surplus" period wheat acreage increased steadily. In the crisis year of 1967–68 wheat acreage in the Prairie Provinces reached an all time high of 29.6 million acres. At the start of the crop year 1969–70, available wheat supplies in Canada reached an all time record of 1.5 billion bushels and the outward carry-over on July 31, 1970, was 1.0 billion bushels. It was this latter position which brought matters to a head, and the emergency government program (the Lift Program) came into effect in 1970 to remedy an expensive surplus situation which apparently appeared permanent to the national government.

Grain policies pursued by the government of Canada during the surplus era show an acceptance on the part of policy makers of the inevitability of such surpluses. Part of this acceptance was no doubt due to the fact that the start of surplus accumulation in Canada resulted from surplus disposal policies started by the United States government in 1953. Whatever the purposes of Public Law 480 and associated legislation in terms of U. S. marketing legislation, it was felt in Canada that American policy was encroaching upon commercial markets and was, in fact, limiting export opportunity for Canada which had no parallel programs nor any prospect of securing resources to finance such programs. The Canadian government no doubt felt that, for the time being at least, Prairie wheat growers through the Canadian Wheat Board were at a disadvantage in export markets. In addition the Prairie Wheat Pools had been pressing for some time for a farm support program based upon "deficiency payments." What the Wheat Pools had in mind was that if the Wheat Board found it necessary to sell wheat below a certain stated price, the difference between the stated price and prices available in export markets should be made up by the government, presumably by payments into each annual Wheat Board Pool Account.

The government of the day was not prepared to accept the deficiency payment concept but by 1955 had decided that some assistance should be provided for Western Wheat growers. The government plan was to help pay carrying charges, i.e., interest and storage charges, on the large stocks of wheat in Canada at the expense of Pool Accounts. This concept was enshrined in legislation that became known as the Temporary Wheat Reserves Act. The Act made the government a partner in looking after the surplus wheat stocks carried in Canada in 1956–67 and in subsequent years and implied that the government was not worried about the pile-up of wheat. More and more often the expression "national asset" was applied to increased carryovers.

Two years later in 1957 with wheat carryover still on the increase and with elevators filled to capacity with grain, Canadian wheat policy was again adjusted. To meet the producers' problem of delivery opportunity in the face of congested elevators, the Prairie Grains Advance Payments Act was passed. Under this legislation producers could apply for loans on farm stored grain to the extent of their probable delivery opportunity for the crop year under delivery quotas established by the Canadian Wheat Board. Loans on farm stored grains were simply a logical extension of the policy of accommodation which the government had been following.

Pressure of surplus stocks of wheat was relieved somewhat by the drought of 1961 and by the bumper export years of 1963–64, 1965–66, and 1966–67 which greatly stimulated producer optimum. But production also hit record levels and there was little or no erosion of surplus wheat stocks in the boom years of the 1960's.

In 1967 two important developments transpired. The International Grains Arrangement, which included a sharp increase in minimum prices over the levels of the preceding International Wheat Agreement, was negotiated but not ratified. On the strength of this negotiation the initial payment for wheat was increased from $1.50 per bushel to $1.70 per bushel both basis No. 1 Northern Wheat in store the Lakehead or Vancouver. Also wheat acreage in the Prairie Provinces, which had been increasing steadily throughout the 1960's, reached an all time record of 29.6 million acres in 1967, 5.7 million acres over the level of 1960.

The period from 1952–53 to 1967–68 was therefore a time when wheat acreage and surplus stocks of wheat reached record levels; government wheat policies were based upon helping to accommodate large surpluses, sharing the costs of maintaining such surpluses, and helping producers maintain this position in the face of these surpluses; and producers, given the policies in effect, seemed ready to produce wheat not only for domestic and export markets but for storage in Canada.

Unanimity of Opinion

The period from 1952–53 to 1967–68 as described possessed another extremely important characteristic. This was the unanimity of belief that prevailed in Canada, in the West, and in Parliament itself that wheat policies being pursued were basically right, that the management of surpluses was not detracting from merchandizing efforts, and that resources being used to finance surplus stocks were being employed in a useful manner. For all these years scarcely a dissenting voice was raised against prevailing policies, and under the circumstances it was easy for governments to carry on without any meaningful changes in policies.

Protesting voices did not arise in 1967–68 when the government, with record wheat stocks on hand and elevators suffering from almost complete congestion, with the concurrence of the Wheat Board raised the initial wheat price from $1.50 per bushel to $1.70 per bushel basis in store Port Arthur/Fort William and Vancouver. It can be said, however, in defense of the government's position that the 1967 International Grains Arrangement had been under negotiation for many months. The farm group of advisers were insistent on higher minimum prices under any agreement reached and, of course, were hopeful that a higher trading range would be forthcoming, thus preserving the pattern of preceding International Wheat Agreements. Nor can it be forgotten that inflation had been eroding the returns received by wheat producers for their wheat, thus causing further aggravation of the cost-price squeeze, a growing concern over the years.

It is not likely, however, that any government and/or Wheat Board will again enjoy such a long period of freedom from critics in respect to policy matters as occurred in Canada from 1952–53 to 1967–68. Nor is it desirable that such a noncritical attitude towards wheat marketing or any other major public policy should recur.

Remedial Measures

In 1970–71 the government implemented its "Lift" program, a program designed to reduce wheat acreage sharply and promptly, thereby bringing about a reduction in wheat inventories in Canada. The objectives of the program were speedily accomplished.

The wheat crisis of 1967–68 and subsequent years helped ensure a basic review of policies. The two aspects of policy which attracted most attention were the wheat policies pursued by the government under which the Wheat Board operated and the policies followed by the Wheat Board in pricing and selling wheat.

In July 1970 the Canadian Wheat Board appointed a committee of international scope to evaluate Canada's system of selling grain under changing world conditions and to report to the Board as soon as possible. Having had the honour of serving as Chairman of the Committee, I would like to tell you about some phases of our work.

The Committee had not been at work very long before we found, to quote the report, that "Canada's once proud position of selling a product which was indispensable to millers in importing countries had been eroded. Quality, pricing, and services have not adjusted sufficiently to changing buyers' demand and competitors' innovations" [2, p. 1]. This was a challenging observation which seemed to strike at the heart of the Canadian grain marketing problem. The Committee turned its attentions to remedies which might be effective in the long term.

In its remit the Committee was asked to formulate its recommendations within the premise that the Canadian Wheat Board system of centralized selling would continue in effect. This limitation did not prove to be restrictive as far as the Committee was concerned because it was evident that the Wheat Board, in spite of existing difficulties, was deeply entrenched in the Canadian grain marketing organization. The Committee appreciated that the Canadian grain marketing system consisted of a number of important parts ranging from producers, the Government, public and private grain handling and regulatory organizations, transportation facilities, inland water transporation, port facilities, etc. The Committee found that there was a need for all the forces operating in the Canadian economy to be mobilized into a fully integrated structure. It was to this lack of integration and coordination that some of Canada's marketing difficulties could be traced.

The Committee also found that market changes were occurring much too rapidly for policy adjustment in Canada. Therefore the Committee saw the need for a continuing and representative body which would keep marketing policy and market change closely related and eliminate the lag between policy change and market change which had proved costly in the past. The Committee recommended improvements in the grading system and in particular pressed for protein content as a grading factor. The Committee endeavoured to facilitate this development as between the agencies involved.

A very strong position in relation to production levels and inventories was taken by the Committee. The excessive costs involved in carrying unneeded stocks of grain was critically noted. However, it was noted that if producers deliveries were to be related to market requirements, then a system of income stabilization was essential. These were among the points designed, not to change the system, but to make it more effective in a marketing sense.

In moving from 20 years of surpluses to a sudden shortage position, I believe no significant changes in wheat marketing procedures will be involved. The Wheat Board will continue to be basic to the Canadian Wheat marketing system. Any changes will be related to the problem of coordination, getting the best results from the constituent elements in the grain trade. I hope that an inability to supply markets in full will not occur, or, if it does occur, the duration of such a period will be short. Few will maintain that we are as efficient as we could be in assembling, storing, and shipping our wheat supplies. Maximum efficiencies will come only when marketing services of all kinds are kept under continuous review and scrutiny.

I must add that the greatest single fault in Canadian wheat policy over the past 20 years has been its responsiveness to short term pressures and the absence of basic and longer term reviews of the wheat situation. Canada's role in and almost unbelievable optimism about the 1967 Grains Arrangement provide an excellent demonstration of this point. At the same time, while surpluses and marketing difficulties were clearly in evidence for the next few years, it was virtually a matter of simple arithmetic to predict that the world would be facing a serious food shortage by 1973 at the latest. This is not a matter of hindsight but was predicted in 1967 both with confidence and concern. If these longer term considerations had influenced Canadian policy, both the errors and mistaken assumptions associated with the I.C.A., which in turn led to those of the LIFT program, just when the food crises was emerging, could have been avoided.

The Domestic Market for Feed Grains

There have been some changes in policy relating to the marketing of feed grains in the domestic market. The distribution of western feed grains in feed deficit areas in Canada has always been a matter of some controversy, especially since the national government became so involved in marketing matters.[3] When the Canadian Wheat Board took over the marketing of oats and barley in 1949, a major decision had to be made. Would feed grains be marketed by the Wheat Board through the usual channels of trade, including the Winnipeg futures markets, or should the Board undertake to market feed grains as it marketed wheat, to buyers for the domestic and export markets?

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[3] Most controversy was about adequacy of supply, shipping policies, stocks for winter storage, and pricing at various eastern positions.

A number of factors entered into the Wheat Board decision to use the traditional marketing facilities available. There were a number of cogent reasons for this decision but one of the reasons was the unwillingness of the then Wheat Board to assume the role of arbitrator between the producer interest and the Western and Eastern feeder interests in the matter of price. Therefore, the Board decided to sell its holdings through the futures markets where purchases could be made by all buyers at market prices.

In recent years there have been some demands in feed deficit areas in both eastern and western Canada for more equality in feed grain prices as used by feeders in the Prairie Provinces and by feeders in deficit areas. Apparently it was considered that the desired result was not being brought about through the market place. The escalation of feed grain prices over the past 12 months has aggravated the problems of all feeders throughout Canada.

The significant element of the government announcement of August 3, 1973 was that the government had taken the initiative in directing the price relationships that are to exist between the costs of feed grain to feeders on a regional basis. Another important aspect of the new program is that it seems to reduce the role of the Wheat Board in the domestic feed grain trade.

A new factor brought into the feed grain marketing structure is the Agriculture Products Board. This Board will purchase feed grains from producers on a guaranteed price basis, the guarantee being probably somewhat higher than the Wheat Board's initial payment. It is not clear as to how the Agriculture Products Board will dispose of its holdings. The responsible government Ministers have indicated that the new policy is still in the making and they must be given time. Whatever finally emerges, it is to be hoped that natural advantages in grain production or livestock production are not invalidated and basic efficiencies are preserved as government controls are extended.

Oilseeds

The oilseeds—flaxseed and rapeseed—have been marketed by producers outside the Wheat Board. This policy is under review, and following a half century of historical precedent, presumably a vote will be taken among producers to ascertain their wishes as to whether flaxseed and rapeseed should be sold through the Wheat Board.

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Grain Marketing Methods in the U. S. A.—The Theory, Assumptions, and Approach*

LEONARD W. SCHRUBEN

My thesis is that during periods of worldwide grain shortages a free market in grains cannot properly serve a domestic economy and also protect U. S. national interests, because most of the worldwide grain buying is by state monopolies.

Incorrect assumptions about the competitive structure of international trade in grain apparently have led to the use of the wrong model as a basis for U. S. trade policy. As a consequence, serious errors committed last year suggest that the economic theory guiding U. S. grain marketing is not the correct one to use.

U. S. policy and actions have assumed a high degree of competition throughout the world grain marketing system, an extension of a nearly perfect competitive market structure observed among domestic producers and marketers. While this condition may extend several stages beyond the farmer's gate, current events suggest that a continuum through increasing degrees of market concentration prevails at various stages of the marketing channel. Cartels, which exercise monopoly within the nations sponsoring them, possess an advantage when buying grain from the U. S. The limited number of cartels, or national monopolies, making up the world market have strong oligopolistic tendencies.

As a consequence, when a government agency (or a private firm acting for the government) goes shopping for grain, it acts on behalf of all the demanders, i.e., buyers, in that country. The demanders have no opportunity to react as individuals to a change in prices by reducing purchases as prices advance. Such a buyer may arrange contracts with U. S. suppliers to purchase more grain than is available as no seller knows the total quantity others have sold.

For example, when one national purchasing agency has the gold and the desire to buy, say, an additional 400 million bushels of wheat, such a transaction does not allow gradual rationing among potential demanders to take place in response to price. Price is fixed by government for the purchasing country; in the U. S. the grain is committed, then prices rise too rapidly for orderly adjustment.

Each seller, not knowing what others have sold and perhaps without wheat in inventory, likely will cover his sale by purchasing a futures contract from a speculator who has neither the wheat nor an intention to make an actual delivery. The speculator performs his useful role of absorbing price risk but, at the same time, he gives a false measure of security to sellers. Collectively, more grain than is actually available may be sold for export. Speculators cannot make delivery, contracts are broken, and chaos results.

The foreign purchase in such an event results in a corner on the U. S. market. As the buyer is capable of squeezing the sellers, he does so. Because he wants actual delivery and has gold to pay the contract price, all he needs do is hold his contract and wait for the cornered seller to bid prices high enough to move grain away from domestic use into foreign markets. Then domestic users absorb the full brunt of adjustments to higher prices. If the dollar price of gold rises after the initial purchase but before settlement is made, that further insulates the foreign buyer from price increases to the extent that gold price increased.

Furthermore, if the foreign buyer correctly anticipated the impact his single large purchase would have on price (and most buyers would), he could buy on contract a supply somewhat greater than his real need. After the price went up, he could sell the excess at the higher price to help cover costs of the grain he really wanted. If in addition there is an export subsidy to pay for shipping, and if the excess purchase was proportional to the increase in grain prices, the foreign buyer could obtain grain delivered to his country at no real cost to him. His initial supply of gold would still be intact. The increase in U. S. prices would benefit him rather than cause him to decrease purchases in response to higher prices. Who would turn down free wheat in a hungry world?

A "corner" on the futures market is defined in the dictionary as "the state of things produced by a person or persons who buy up the

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whole or the available part of any stock or species of property, thus compelling those who need such stock or property to buy of them at their own price; as, a corner in wheat or in cotton." That describes fairly well the 1973 soybean and soybean meal futures market for old crop delivery.

Assistant Secretary of Agriculture Brunthauer is quoted in the trade press as having said in late June that exporters already have contracted to ship overseas enough old crop soybeans that would run the U. S. completely out of soybeans by August and leave U. S. livestock industries short of their needs by more than 1 million tons of soybean meal. Assistant Secretary of Agriculture Bell reported that 2.2 million short tons of soybean meal were already committed for export by mid-June, leaving 1.9 million short tons for domestic use and that we have an estimated domestic need for 3.3 million short tons.

The above comments do not suggest that the corner was illegally obtained. Rather, it could have resulted from the structure of the market as previously described.

The breakdown of the grain marketing system in the U. S. resulted from a basic error in the theoretical description of market structure. Unless steps are taken to modify the structure, the prospect is for more cornered markets in years when world grain production is short. It has long been observed that assumed and necessary conditions of free competition do not exist in the real world. It is time to rebuild the grain marketing system in the U. S. to recognize actual conditions of trade and market structure. Large crops and years of surplus commodities hide the need for such a change. They do not make such a change unnecessary. Surpluses make it appear that a competitive market exists in international trade when in fact the situation is more nearly an oligopoly.

Historical Perspective

International trade in grains evolved in an atmosphere of competition. The United Kingdom, through large interests in shipping, financing, insurance, and merchandising, dominated world trade in grain until after World War I. The development of steam power made feasible the building of large cargo ships and efficient rail service to points in the interior of North America not served by river or canal systems. The British bought grain, supplied capital to build the ships and railroads, and organized the markets. They were dedicated to international trade free of government interference. Grain production and marketing prospered around the world in an atmosphere free from state trading and government involvement.

About the time of World War I, world grain trade began to expand. Transportation technology, both land and sea, made that possible. Increased grain production in the heartland of North America provided the raw grain. England's industrial revolution provided the manufactured goods to exchange for grain. Liverpool was the hub of the world's grain trade, and markets over the world followed its leadership.

In the U. S. until the 1860's, government services were largely civil, consisting of such things as defense, police protection, and enforcement of contracts. There were few, if any, economic programs specifically for agriculture. A new relationship between agriculture and government began in the 1860's with the Land Grant College system and the Homestead Act. But, government did not directly participate in business and marketing decisions of individual producers or market agencies.

Technological changes in producing grain have had an important impact on market structure. Petroleum replaced the horse and mule as the important power source for rural America. Oats declined in importance. Hybrid corn and grain sorghum were discovered, soybeans were introduced, and yields increased materially.

At the turn of the century, grain was grown on comparatively small farms. Grain destined for commercial channels was virtually all delivered to a nearby grain elevator. Horses were the source of power, including power to pull the wagons that hauled the grain to market. Because of the transport situation, farmers had very little choice as to the point of the first sale. Small grain elevators were built at frequent spacings along railroads to provide convenient points of first collection. Practically all grain moving through commercial channels, then, was gathered by local elevators and shipped to terminal markets by rail. Wheat, oats, and barley were cut by binder or header; the unthreshed grain was stacked or shocked; and it was threshed later in the fall and winter, usually by a custom-operated threshing machine. Corn was picked by hand and stored in a crib. Much of it was fed to livestock on the farm where it was grown. Soybeans were not grown commercially, and combine-type grain sorghums had not yet been developed by plant scientists.

Under that system, grain entered commercial market channels over an extended period. It reached the market at a leisurely pace. There was plenty of time to move it to terminal facilities for storage, processing, or further shipment. And not nearly so great a quantity entered commercial channels.

The country elevator was, basically, a grain receiving station. Commercial grain was loaded out approximately as received. There was no need for large local elevators as grain was stored on the farm in the stack, shock, crib, or granary until the system could handle it.

Under that arrangement, terminal markets dominated commercial channels. Located at strategic points, each could draw from a wide area. Production in any given part of the territory generally varied a great deal from year to year. But when production was low in one area, it generally was high in another. Thus, the increased production in one area offset declines in another. The result was that terminal locations could handle the crop for a territory with less required facilities than if the same crop was stored locally. In short, they were more efficient, and their development was a consequence of their efficiency. Line elevators, generally under the control of a firm with headquarters in a terminal market, were an important factor in the scheme of things. Grain cooperatives were unknown.

Sophistication in the performance of marketing functions came about because of the relentless economic pressure for specialization in the productive processes. The advantages of specialization in production cannot be realized unless marketing processes keep pace. Together they result in a higher standard of living, because the benefits of specialization result in a greater total production for society as a whole. Roundabout production is a consequence of specialization in the more economically developed countries, to the point where the producer does not know who is going to use his products. The local mill is a thing of the past in such countries. Much of the grain is produced for the market, and middlemen perform the many tasks of moving it to the consumer. Marketing channels have become long and complicated.

Uncertainties in the market are created by lengthened roundabout production. Uncertainties also are the stuff that spawn government programs. The 1973 export embargo on U. S. soybeans is an example.

Different nations have reacted differently to outside pressures on their domestic economies. In a former period when each country was largely self sufficient in grains, and international trade was of small importance, there was not much pressure from other countries. Since the turn of the century, the grain markets of the world have changed almost beyond recognition. In 1900 there was virtually no government involvement any place in the world. Today there is virtually no country where government or government-licensed operators do not dominate the grain market. Then, prices throughout the world were equalized by the flow of grain through market channels. Now, there are islands of price differentials over the globe. Then, grain was grown and marketed largely as individuals saw fit and as opportunities were available. Now, governments dominate many individual transactions. The growth of international trade has given rise in most trading nations to various schemes that insulate their internal grain industry and markets from adverse foreign influences to the greatest possible extent.

The International Wheat Agreements and the International Grain Agreement were set up in an effort to alleviate some of the uncertainties. But they have been one-sided at best and ineffective at worst. Canada organized wheat marketing pools, the forerunner of the Canadian Wheat Board. The USSR created a state monopoly as an extension of its standard operating procedure. India and Japan set up food agencies within established departments. Other countries have adopted similar policies. The grain marketing system in the United States, on the other hand, has evolved as one with virtually no direct government participation in setting terms of trade under conditions of world food shortages. Government programs in the U. S. are producer oriented, conditioned to surplus production with virtually no attention to steps in the marketing channels beyond the farmer's gate.

Although a major force in the grain market since the late 1920's, farm programs in the U. S. were developed primarily with farmers in mind. An occasional thought may have been given to the direct impact a given program would have on the market structure. Generally, however, such occasional thoughts do not appear to have counted when decisions were being made. Surpluses made it appear that a competitive market existed but the international market structure changed to resemble more nearly oligopoly. Old assumptions do not apply to today's situation.

The interplay of foreign trade in grains and domestic market needs to be recognized more fully. When agricultural policy was being debated in the late 1920's and early 1930's, exports were a minor concern. Chief policy making officials of the U. S. Department of Agriculture ignored exports because exports simply were not important. The U. S. had withdrawn from the world market. Consequently, very little thought was given to coordinating domestic and export programs. In numerous instances domestic and export programs turned out to be almost in direct conflict. Administration of farm policy was concerned almost exclusively with domestic programs.

At one time, there apparently was hope that a high tariff would provide adequate protection for American farmers. Eventually it was recognized that tariffs were ineffective in raising prices above world levels for commodities on an export basis. That was clearly expressed in the 1932 *Yearbook of Agriculture* by Arthur M. Hyde, Secretary of Agriculture:

> The farm commodities that we sell heavily in foreign markets are those that are depressed most seriously. Wheat and cotton are conspicuous examples.
>
> In urging an agricultural policy directed toward lessening our dependence upon foreign markets we do not ignore the relationships in which different leading products stand toward the export demand. With some products, such as cotton, we have natural advantages that give us competitive strength in international trade. With other products, such as wheat, our position is less advantageous.
>
> If a surplus must be sold abroad, the price falls in the domestic market to a point at which foreigners will buy. This explains why foreign takings have a greater influence on prices than their proportion to the total supply would indicate. No device can be a remedy which tends to increase exportable surpluses. Actually to reduce these surpluses is the only logical course.

The 1935 *Yearbook of Agriculture* reaffirmed the policy of withdrawal from export markets:

> Since 1933 the demand from abroad for American farm products has undergone no material change. Our exports of grains and livestock products have almost disappeared. We continue to export cotton and tobacco and fruits in large quantities, but the foreign market for these commodities is not what it was. In the case of all food products except fruits, we have still to think in terms of a sharply curtailed foreign outlet. As far as we can see for the moment, our emergency program and the first phases of our long-time program must be shaped toward reduced production for export.

During World War I, the U. S. had firm controls on the grain market, but those controls were discarded about the time Europe's agriculture recovered. The agricultural depression of the 1920's spawned a number of voluntary adjustment programs that failed. The Farm Board was created to provide orderly marketing. It failed and brought down the newly organized farmer cooperatives. Canada had somewhat similar experiences during that period. Its cooperatives pooled wheat for sale as did some U. S. cooperatives. When the system collapsed in the U. S., nonfarmer-owned enterprise took its place. Canadians turned to the federal government to operate their wheat marketing system.

In 1933 a long succession of government programs began with the Agricultural Adjustment Act. None of them fully considered the relationship between domestic and export markets. Post World War II domestic farm programs were developed largely under the assumption that little grain would be exported. True, there was more of a stir in this direction with the development of the United Nations and its various agencies. More people were supporting efforts to increase grain exports from the United States. But the position of the United States Department of Agriculture indicated the prospects were none too bright.

An excerpt from the USDA *Wheat Situation* of August 1946 illustrates the point in case of wheat. The same views appear to have prevailed with respect to the export potential of other grain.

> Our share of the total exports also depends upon the distribution of surplus supplies. Now, as following the last war, exports by the United States are large. Then, as now, we had large supplies of wheat, and supplies in other countries were relatively small. In 1920–21, net exports of wheat and flour by the United States totaled 313 million bushels; 3 years after in 1923 they were down to 132 million. In each of the two years of large exports just prior to the last war, 1937–38 and 1938–39, they were only about 105 million bushels. In contrast, in 1920–21 exports of wheat and flour from Canada totaled 200 million bushels; 3 years later they were up to 344 million, and 1939–40 about 210 million bushels. In 1945–46, United States exports were just short of 400 million bushels. But after the extraordinary demand following the war is satisfied, and supplies in other countries have had time to increase—

both in exporting countries and in importing countries—our exports may be expected to average well under 100 million bushels.

Grain distribution and pricing systems were developed before exports were an important factor in United States grain sales. The U. S. market system has had to change to meet the requirements of the new conditions, conditions that the U. S. had little or no influence in creating. The model assuming pure competition no longer describes international grain trade, but unfortunately U. S. government agencies and marketing firms largely continue to act as if it did. No economic model can predict all the conditions of foreign grain trade because internal politics of the trading nations and world diplomacy that each follows create a special set of problems apart from economics.

Increased use of grain in diplomacy presents problems for producers and the marketing system to solve. In general, producers likely will benefit, but there will be some aspects that neither producers nor marketers will like. For one thing, the movement of grain into foreign markets will flow and ebb as required by diplomacy—as well as by economics. Thus, uncertainty of foreign grain markets may increase.

Man discovered the benefits of specialization and exchange in primitive times, perhaps by exchanging a mess of fish for a basket of taro. Both parties discovered they could thus live "higher on the hog." As people gathered themselves into nations (or were so gathered), it appeared that benefits could accrue to rulers by imposing restrictions on trade between their subjects and those of other nations. Especially would this be true if the other nations did not retaliate. Tariffs and trade barriers were imposed. Other nations soon retaliated. Then it was the first nation's turn to further restrict trade. Thus a web of trade restrictions grew.

Gone are the days when people simply traded with each other. Gone are the days when trade was determined by simple comparative advantage. The world lost some of its potential benefits through specialized production and trade. Roundabout production led increasingly to roundabout trade with complex interdependent market channels, a principal characteristic of trade today. There is nothing on the horizon to indicate a reversal of the trend. No sign has appeared to indicate that the web of trade restrictions can be unwound. If that observation is accurate, the international grain marketing system increasingly will be dominated by regulations and trade barriers. In the meantime, the U. S. cannot continue to base its policies on an economic model that neither exists nor is likely to exist in the foreseeable future. A realistic evaluation of the entire grain marketing system should receive top priority.

The export subsidy, Public Law 480, and similar temporary programs have taken on the look of old, well established institutions that involve government support of exports during periods of surplus. Only during World Wars I and II did government intervene in markets under conditions of world scarcity. Whereas Canada had a few years' successful centralized selling experience with cooperative pools between the wars, the U. S. did not. As a result, the experience of central marketing is limited in the U. S. Neither market agencies nor government has worked out a central marketing system. The U. S. could use the well established Commodity Credit Corporation to impose a state monopoly quickly, if it chose to do so. The framework for such action is in place.

Events of the past year have resulted in violent market reaction, refusal to honor firm contracts to sell to foreign buyers, belated recognition of the existence of a cornered market, and finally massive government intervention. The unequal competitive structure of the market made those disasters possible. Such events make it likely that radical forces have been set in motion that will result in drastic and permanent changes in the grain marketing system in the U. S. A., especially of export sales.

A joint expert panel should be created by Congress and the Administration to make recommendations for the coordination of U. S. domestic and foreign trade programs. Account should be taken that there likely will be periods of surpluses and shortages of grains. U. S. policy should be able to cope with either in a respectable manner.

Sectional Meeting B

GRAIN MARKETING METHODS IN CANADA AND THE UNITED STATES

Discussants: Glen R. Purnell, Alberta Department of Agriculture; Donald E. Anderson, North Dakota State University

Sectional Meeting C

GRAIN HANDLING AND TRANSPORTATION

CHAIRMAN: ROY E. HUFFMAN, Montana State University

A Model for Rationalizing the Canadian Grain Transportation and Handling System on a Regional Basis*

EDWARD W. TYRCHNIEWICZ AND ROBERT J. TOSTERUD

THE MARKETING of Canadian grain, and ultimately on-farm grain prices and volumes of grain sales, are influenced by the effectiveness of the grain transportation and handling system. In recent years considerable concern and controversy have arisen regarding the effectiveness and cost of this system. It has been widely suggested that the entire system must be "rationalized" if Canada's competitive position in world grain markets is to be maintained and if producers are to be provided with acceptable service at a reasonable cost.

Unfortunately, time and space do not permit a thorough discussion of the issues relating to the rationalization of the grain transportation and handling system. At the risk of oversimplification, the nature of the rationalization question is outlined briefly.[1] Rationalization, as it relates to grain transportation and handling, usually refers to the abandonment of uneconomic railway branch lines and the resulting abandonment of country grain elevators located on these branch lines.[2] Except insofar as federal government subsidies are received on uneconomic railway branch lines, railways contend that they are losing money on the operation of certain light traffic density branch lines. Understandably, they wish to abandon the unsubsidized facilities or be compensated for their continued use. The grain handling companies, although concerned about the loss of their elevators due to branch line abandonment, are also anxious to discontinue the operation of uneconomical elevators that are small and handle low volumes of grain.[3] An additional complication for the grain handling companies is that many of their elevators are quite old and require substantial renovation or even replacement. Until the grain handling companies are more certain as to which branch lines will be abandoned, they are reluctant to invest capital into improving their country elevators.

The grain producer is concerned with rationalization in that he is already paying all of the charges, but not all of the costs, involved in the movement and handling of his grain from his farm until it is loaded aboard ships for export or domestic destinations. Thus, to him, rationalization implies that he will have to deliver his grain a greater distance with a resulting higher cost, assuming that handling and distribution charges remain unchanged. Many small Prairie communities are also concerned that rationalization of railway branch lines and country elevators will be their "death knell." In addition, there are numerous regulations relating to the movement of grain and operation of country elevators that are imposed by regulatory bodies such as the Canadian Wheat Board, the Canadian Grain Commission, and the Canadian Transport Commission; these bodies will be in-

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* Helpful comments on an earlier draft of this paper were received from J. Heads, J. A. MacMillan, R. Q. Nichols, A. W. Wood, and D. Zasada. Of course, any errors of omission or commission are the authors' responsibility.

[1] A more detailed discussion of the issues relating to grain transportation and handling in Western Canada may be found in Tyrchniewicz and Tangri [14] and Tosterud [11, Chapter 2].

[2] Another interpretation of rationalization is the trading and subsequent consolidation of elevators by grain handling companies.

[3] Actually, the grain handling companies may prefer to consolidate, rather than abandon, uneconomical elevators in order to reduce labor costs but still maintain revenue and market share.

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volved in one way or another in any rationalization scheme.

The overall objective of the study described in this paper was to develop a framework or model within which rationalization of the grain transportation and handling system in Western Canada could be analyzed. Specifically, a simulation model was developed to measure the economic impact of alternative rationalization schemes at the regional level on grain producers, country elevator operations of grain handling companies, and the railways. The remainder of this paper focuses on: (1) a description of the simulation model, including conceptual framework, empirical procedures, assumptions, and data requirements, and (2) some empirical results.

Simulation Model for Grain Transportation and Handling Rationalization

Conceptual framework

The Stollsteimer plant location model [8] was the starting point in developing a conceptual framework for analyzing the rationalization of the grain transportation and handling system in Western Canada. In essence, the Stollsteimer model provided a basis for determining the number, size, and location of raw material processing plants that minimize the combined collection and processing costs involved in assembling and processing any given quantity of raw material produced in varying amounts at scattered production points [8, pp. 631–632]. However, some modifications were necessary before this model could be applied to the grain transportation and handling system in Western Canada.[4] These modifications included:

(1) Application to the collection, handling, and distribution of grain in Western Canada. Although this modification may appear to be rather simplistic, the application to the grain transportation and handling system in Canada is unique compared to other applications of this type of model.

(2) Introduction of a grain collection cost function. Rather than use a constant unit collection cost with distance being the only variable, we introduced a collection cost function where unit collection costs were dependent upon a number of variables whose values changed under different conditions of grain collection.

(3) Inclusion of a grain distribution activity. The cost of distributing the grain by rail from country elevators to export terminals was included in the model.

(4) Consideration of existing processing plants (country elevators). Existing country elevators were considered in two ways: as a restraint in the model where some or all of those elevators would be forced into the final location pattern, or as possible locations for the construction of new elevators.

(5) Introduction of institutional constraints. The impact of institutional constraints such as the "freeze" on branch line abandonment, the Crowsnest Pass rail rates on grain fixed by federal statute, and the negotiated handling rates at country elevators, compared to no constraints, was measured by the model.

In summary, the conceptual model is based on the principle of minimizing the total cost of collecting, handling, and distributing grain, subject to certain specified constraints. Mathematically, the model may be expressed as:

For given L_kM,

$$\text{Min TC} = \sum_{i=1}^{I} C_{ij}X_{ij} + \sum_{j=1}^{J} P_jX_j + \sum_{t=1}^{T} R_{jt}X_{jt}$$

where

$TC =$ total collection, handling, and distribution costs;

$C_{ij} =$ cost per bushel of transporting grain from farm i to elevator j;

$X_{ij} =$ bushels of grain transported from farm i to elevator j;

$L_k =$ a locational pattern for J elevators among the $\binom{L}{J}$ possible combinations of locations for J elevators given L possible locations, $J \leqq L$;

$M =$ institutional constraints;

$P_j =$ cost per bushel of handling grain at elevator j;

$X_j =$ bushels of grain handled at elevator j;

$R_{jt} =$ cost per bushel of transporting grain by rail from elevator j to terminal t; and

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[4] Critiques and modifications of the Stollsteimer model are presented by Polopolus [6], Bobst and Waananen [1], Chern and Polopolus [3], Warrack and Fletcher [15], Toft, Cassidy, and McCarthy [10], Ladd and Halvorson [5], and Candler, Snyder, and Faught [2]. Modifications for purposes of this study are elaborated in Tosterud [11, pp. 54–63].

X_{jt} = bushels of grain transported from elevator j to terminal t.

Empirical procedure

The basic data requirements for applying the CHAD (collection, handling, and distribution) simulation model include: the number and location of farmers in the chosen geographic area; bushels delivered by each farmer; characteristics of trucks used in delivering grain (age and size); collection cost functions for farmer-owned trucks, and for custom trucks in the instances where farmers do not own a truck; the distance between each farmer and each delivery point in the chosen area; the identification of delivery points in the chosen area, including size and number of elevators at each delivery point; operating cost functions (or handling rates) for elevators; identification of terminals to which the grain is delivered; and rail costs (or rates).

An important consideration in applying the CHAD simulation model was the determination of the delivery point for each farmer. Following the usual assumption of location theory that collection costs are minimized by minimizing distance, it would be expected that farmers would minimize their collection costs by delivering their grain to their nearest delivery point. In reality, however, each farmer has the option of choosing his delivery point, and many farmers choose delivery points for reasons other than minimum distance.[5] For purposes of this study, this method of choosing delivery points is defined as the farmers' preferred delivery point criterion. The CHAD model has been designed to simulate the grain transportation and handling system using either the minimum distance criterion or the farmers' preferred delivery point criterion.

The empirical procedure is sketched out in the remainder of this section with reference to the application of the CHAD simulation model.[6] A general flowchart of the simulation model is presented in Figure 1. The area selected for the simulation of the grain transportation and handling system was the Boissevain area of Southwestern Manitoba. A map showing the location of railway lines, delivery points, and major roads in the Boissevain area is presented in Figure 2. From data supplied by the Canadian Transport Commission, 2,187 farmers were identified as delivering grain to 31 delivery points with a total capacity of 5.9 million bushels (67 elevators) in the specified area in the 1970–71 crop year. These farmers delivered a total of 8.4 million bushels of wheat, oats, and barley during the crop year. Approximately 80 percent of the farmers used their own trucks to deliver grain, and the remainder were assumed to use a custom trucker. Distances between each farmer and each delivery point in the region were provided by the Canadian Transport Commission; the average distance to the farmer's preferred elevator was 6.6 miles, and 5.3 miles to the nearest elevator.

The collection cost function for grain transported by farm truck was developed using the data base from an earlier farm trucking cost study by Tyrchniewicz, Butler, and Tangri [12]. Similarly, the collection cost function for transporting grain by custom truck was taken from a custom trucking cost study by Tyrchniewicz and Moore [13]. Operating cost functions for different sized elevators were developed by Tangri, Zasada, and Tyrchniewicz [9]. An alternative measure of elevator operating costs was the elevator handling rate actually charged to farmers. This handling rate is negotiated on an annual basis by the Canadian Wheat Board and the grain handling companies. Rail cost estimates for movement of grain were provided in the Grains Group Report [4]. Alternatively, Crowsnest Pass rates were used. There was a variety of problems and weaknesses involved in using these functions and rates, but a discussion of these is beyond the scope of this paper. The interested reader is referred to Tosterud [11].

As with any simulation model, many simplifying assumptions were necessary in applying the CHAD model. Some of the basic assumptions included:

(1) Farmers who were diverted to other elevators as a result of rationalization delivered their grain to the nearest delivery point in the Boissevain region.

(2) Farmers owning more than one truck were assumed to use the larger one for delivering grain. If trucks were the same size, the newer one would be used for delivering grain. Farmers identified as not owning a truck were assumed to hire a custom trucker to deliver their grain.

(3) All grain originated at one location on the farm.

(4) All grain was delivered to one delivery point. Splitting deliveries between a preferred

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[5] For a discussion of factors influencing farmers' choice of delivery points, see Riordan [7].

[6] For more details, see Tosterud [11, pp. 67–100].

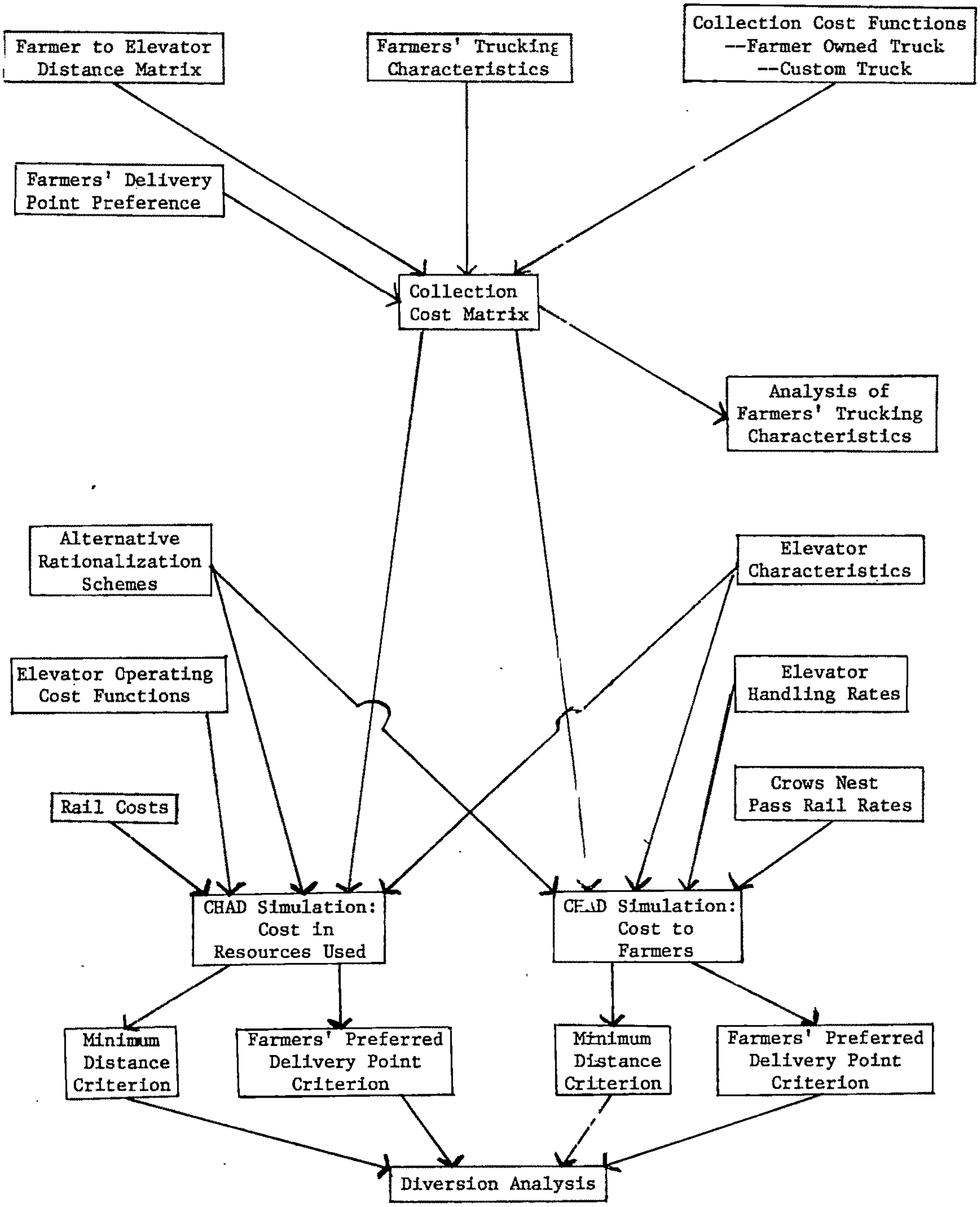
Farmer to Elevator Distance Matrix
Farmers' Trucking Characteristics
Collection Cost Functions --Farmer Owned Truck --Custom Truck
Farmers' Delivery Point Preference
Collection Cost Matrix
Analysis of Farmers' Trucking Characteristics
Alternative Rationalization Schemes
Elevator Characteristics
Elevator Operating Cost Functions
Elevator Handling Rates
Rail Costs
Crows Nest Pass Rail Rates
CHAD Simulation: Cost in Resources Used
CHAD Simulation: Cost to Farmers
Minimum Distance Criterion
Farmers' Preferred Delivery Point Criterion
Minimum Distance Criterion
Farmers' Preferred Delivery Point Criterion
Diversion Analysis

Figure 1. **Generalized flowchart of CHAD simulation model**

point and an alternate delivery point, as allowed under the present quota system, was not permitted in the model.

(5) All grain delivered to the elevator was shipped out; there was no storage build-up or reduction. The impact of rationalization on grain handling companies' storage capacity, costs, and revenues was not considered in this model.

(6) All grain collected and handled in the Boissevain region was shipped out to Thunder Bay.

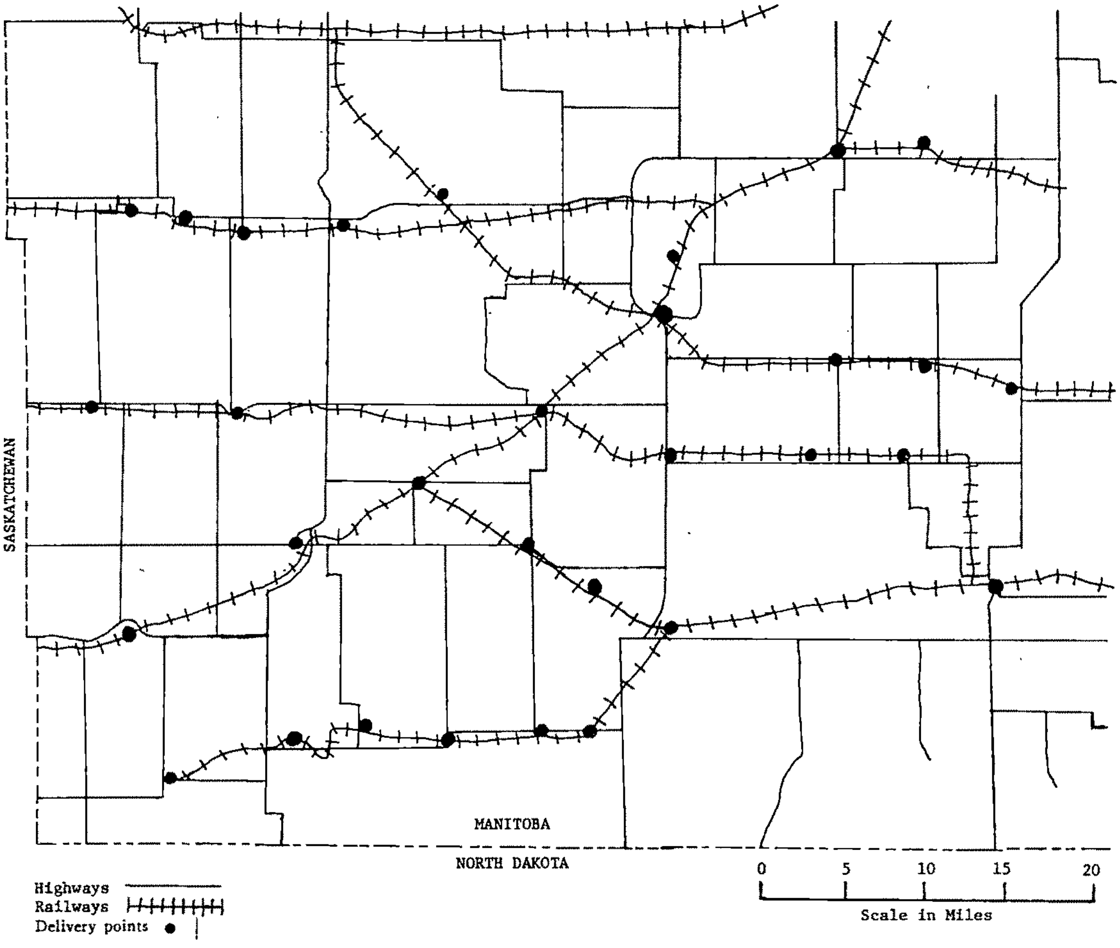

Figure 2. A map of the study area

(7) All rail branch lines were subject to abandonment even though some of them extend beyond the Boissevain region.

(8) Collection, handling, and distribution costs per bushel were the same for all grains.

Once the existing grain transportation and handling system was defined, the CHAD simulation model permitted the abandonment of entire rail lines, delivery points, and/or individual elevators at a delivery point. For the Boissevain region, rail line and elevator rationalization proceeded through eight iterative simulations. The first simulation was the existing system. The second through the seventh simulations entailed the abandonment of six light-density branch lines, one at a time, and in the order in which they would likely be abandoned as a result of branch line abandonment hearings.[7] The simulation model does not permit a branch line, once abandoned, to come back into the model. Once all the light-density lines were abandoned, an eighth simulation was run excluding all remaining elevators that were less than 100,000 bushel capacity.

Empirical Results

In addition to the branch line abandonment simulation results presented in this section, the CHAD model was used to simulate changes in the grain collection procedure in conjunction with branch line abandonment and to simulate the Grains Group's "benchmark" systems for grain transportation and handling [11, pp. 152–195]. Branch line abandonment simulation results are presented for the farmers' preferred delivery point criterion and the minimum distance criterion. Results are in terms of the cost of the existing (simulation one) and rationalized (simulation seven) system[8] to the farmer (using collection costs, handling rates, and rail rates), and costs of resources used (collection costs, elevator operating costs, and rail costs).

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[7] Branch line abandonment hearings are legal procedures that must be followed before any railway branch line may be abandoned. These are specified under the 1967 National Transportation Act.

Branch line abandonment: farmers' preferred delivery point criterion

Using the farmers' preferred delivery point criterion as the existing system, the total cost to farmers for grain collection, handling, and distribution in the Boissevain area in 1970–71 was $1,533,000 or 18.29 cents per bushel (Table 1). Collection, handling, and distribution costs accounted for 16, 31, and 53 percent respectively of total costs. After six light-density branch lines were abandoned, and assuming no changes in handling and rail rates, farmers' costs of collecting, handling, and distributing their grain would be $1,644,200 or 19.63 cents per bushel, an increase of 1.34 cents per bushel. Collection costs increased by 1.38 cents per bushel, or 48 percent; distribution costs to farmers decreased by .04 cents per bushel, or less than 1 percent; and handling costs to farmers remained unchanged.

If the costs of grain collection, handling, and distribution in the Boissevain area were measured in terms of resources utilized under the existing system, the total cost would be $2,845,200 or 33.95 cents per bushel. Elevator operating costs were almost 40 percent higher than the Canadian Wheat Board's handling rate,[9] while rail costs were almost 140 percent higher than the Crowsnest Pass rail rates. Assuming that the cost estimates are correct,[10] the differences between the costs and the rates represent a crude measure of the cost of two of the institutional constraints imposed upon the grain transportation and handling system.

After six light-density branch lines were abandoned, the total cost of collecting, handling, and distributing grain, in terms of resources used, would be $2,507,300 or 29.92 cents per bushel, a reduction of $337,900 or 4.03 cents per bushel. After branch line abandonment, collection costs would be 1.38 cents per bushel (or 48 percent) higher, while elevator operating costs and rail costs would be 3.17 cents per bushel (40 percent) and 2.24 cents per bushel (10 percent) lower respectively.

Under the farmers' preferred delivery point criterion, branch line abandonment (and consequently some elevator abandonment) would result in a decrease in the number of delivery points from 31 to 12, a decrease in elevator capacity from almost 5.9 million bushels to 2.7 million bushels, and an increase in hauling distance to the elevator from 6.6 to 11.7 miles.

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[8] Results for the other simulations are found in [11].

[9] It should be pointed out that elevator operating costs are not strictly comparable to the handling rates in that the farmer encompasses storage costs while the latter includes only two weeks of storage.

[10] There is some doubt as to the validity of the rail costs prepared for the Grains Group by the railways. However, no alternative measure of rail costs is currently available.

Table 1. Aggregate and unit costs of collecting, handling, and distributing grain, branch line abandonment simulation using farmers preferred delivery point criterion, Boissevain region, 1970–71

	Cost to Farmers[a]				Cost in Resources Used[b]			
	Collection Costs	Handling Costs	Distribution Costs	Total Costs	Collection Costs	Handling Costs	Distribution Costs	Total Costs
A. Aggregate Costs (000 dollars)								
Existing System	242.5	481.7	808.8	1,533.0	242.5	667.9	1,934.8	2,845.2
Rationalized System	357.7	481.7	804.8	1,644.2	357.7	402.5	1,747.1	2,507.3
B. Unit Costs (cents per bushel)								
Existing System	2.89	5.75	9.65	18.29	2.89	7.97	23.09	33.95
Rationalized System	4.27	5.75	9.61	19.63	4.27	4.80	20.85	29.92

[a] Based on collection costs, Canadian Wheat Board handling rates, and Crowsnest Pass rail rates.

[b] Based on collection costs, elevator operating costs, and rail costs.

Table 2. Aggregate and unit costs of collecting, handling, and distributing grain, branch line abandonment simulation using minimum distance criterion, Boissevain region, 1970–71

	Cost to Farmers[a]				Cost in Resource Use[b]			
	Collection Costs	Handling Costs	Distribution Costs	Total Costs	Collection Costs	Handling Costs	Distribution Costs	Total Costs
A. Aggregate Costs (000 dollars)								
Existing System	213.4	481.7	810.9	1,506.0	213.4	672.7	1,939.8	2,825.9
Rationalized System	350.4	481.7	805.2	1,637.3	350.4	402.9	1,722.7	2,476.0
B. Unit Costs (cents per bushel)								
Existing System	2.55	5.75	9.68	17.98	2.55	8.03	23.15	33.73
Rationalized System	4.18	5.75	9.61	19.54	4.18	4.81	20.56	29.55

[a] Based on collection costs, Canadian Wheat Board handling rates, and Crowsnest Pass rail rates.
[b] Based on collection costs, elevator operating costs, and rail costs.

Branch line abandonment would result in 46 percent of the farmers and 48 percent of the bushels of grain delivered being diverted to other delivery points.

Branch line abandonment: minimum distance criterion

Using the minimum distance criterion as the existing system, the total cost to farmers for grain collection, handling, and distribution in the Boissevain area in 1970–71 would have been $1,506,000 or 17.98 cents per bushel (Table 2). Approximately 14 percent of this total cost was collection costs, 32 was handling costs, and 54 percent was distribution costs. Comparing the collection costs using the minimum distance criterion and the farmers' preferred delivery point criterion, it appears that farmers in the Boissevain area are incurring an extra aggregate collection cost of $29,100 to deliver their grain to the delivery point of their choice rather than the one nearest their farm. This extra collection cost is equivalent to 0.34 cents per bushel or $13.30 per farmer.[11]

After six light-density branch lines were abandoned, and assuming no changes in handling and rail rates, farmers' costs of collecting, handling, and distributing their grain would be $1,637,300 or 19.54 cents per bushel, an increase of 1.56 cents per bushel. Collection costs increased by 1.63 cents per bushel, or 64 percent, while distribution costs to farmers decreased by 0.07 cents per bushel, or less than 1 percent, and handling costs to farmers remained unchanged.

The cost of collection, handling, and distribution of grain in terms of resources used under the minimum distance criterion would have been $2,825,900 or 33.73 cents per bushel. After six light-density branch lines were abandoned, the total cost of collecting, handling, and distributing grain, in terms of resources used, would decrease to $2,476,000 or 29.55 cents per bushel. This would be a reduction of $349,900 or 4.18 cents per bushel. After branch line abandonment, collection costs would be 1.63 cents per bushel (or 64 percent) higher, while elevator operating costs and rail costs would be 3.22 cents per bushel (40 percent) and 2.59 cents per bushel (11 percent) lower respectively.

Under the minimum distance criterion, branch line abandonment would result in the same magnitude of decrease in the number of delivery points and elevator capacity as under the farmers' preferred delivery point criterion. However, the hauling distance would increase from 5.3 to 11.4 miles under the minimum distance criterion. Branch line abandonment under this criterion would result in the diversion of 54 percent of the farmers and 55 percent of the bushels of grain delivered to other delivery points.[12]

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[11] In addition to the reasons mentioned by Riordan [7], this could be entirely rational from an economic standpoint if, by traveling several more miles, the farmer delivers his grain to an elevator in a lower rail freight rate zone.

[12] The greater diversion of farmers and bushels under the minimum distance criterion is due to the fact that the minimum distance criterion forces farmers to deliver this grain to the nearest elevator which tended to be on branch lines that were subsequently abandoned.

Conclusions

The CHAD simulation model presented in this paper is a first attempt at measuring simultaneously the economic impact of branch line and elevator rationalization on farmers, grain elevator companies, and railways. Although the results of this type of simulation are undoubtedly useful to policymakers and management of grain handling and railway companies, we would be the first to admit that further sophistication of the basic CHAD simulation model is necessary. When simulating a system, one attempts to minimize the use of assumptions and simplifications. But when that system is as complex as the grain collection, handling, and distribution system in Western Canada, compromises must be made, at least at the beginning stages of simulation. The CHAD simulation model contains a number of limitations, and we mention some of these as a challenge to other researchers, rather than as an apology. In fact, many of these limitations are being examined in our on-going research program in grain transportation and handling.

An obvious difficulty of the model is that it does not take account of the "trade-offs" that will have to take place in any rationalization process. At first glance, the empirical results from this model suggest that farmers will inevitably end up paying more for grain transportation and handling while the railways will always realize a saving. In reality, one would have to weigh these results against the probability and/or necessity of changes in the institutional constraints on the grain transportation and handling system, such as changes in the Crowsnest Pass grain rates. Although results of the type presented in this paper would be useful for the negotiation process, they cannot provide the ultimate answer.

The need to define the boundaries of a region results in many problems. Perhaps the greatest one is that farmers' alternate delivery points after abandonment must lie within the region. In reality, the farmer might choose a delivery point outside the region. However, the regional approach to grain transportation and handling rationalization can be defended on the grounds that "real world" rationalization, as permitted under the National Transportation Act, will take place on a small regional basis rather than a Prairie-wide basis. In addition to the obvious problems of defining the boundaries of a region, it can be argued that a macro Prairie-wide simulation model would be very useful for longer-run policy formulation on rationalization.

The CHAD simulation model abstracts from the effects of certain institutional constraints, such as the Canadian Wheat Board quota system and block shipping system on collection, handling, and distribution costs. The introduction of the alternate delivery point system makes it extremely difficult to measure the impact of rationalization on farmers' collection costs. This also makes less tenable the assumption that farmers choose their nearest delivery point when their preferred delivery point is closed due to abandonment.

One of the major limitations of the CHAD simulation model was the manner in which elevator operating costs were handled. Elevator operating cost functions were estimated on a delivery point rather than individual elevator basis because it was impossible to determine, in cases of multiple elevator delivery points, the elevator to which each farmer actually delivered his grain. Other data-related problems included the exclusion of non-Wheat Board grains from farmers' deliveries,[13] insufficient information on characteristics of custom trucks used in hauling grain, and cost functions based on different time periods than the crop year to which they were applied.

Rationalization of the grain transportation and handling system has political and social, as well as economic, implications. Although some institutional constraints were incorporated into this study, the CHAD simulation model is based almost entirely on economic considerations. Even if the CHAD simulation model is refined to the point where it provides accurate measures of economic implications, the more difficult problem of evaluating the social and political costs and benefits of rationalization remains largely unsolved.

Under the farmers' preferred delivery point criterion, farmers were probably selecting elevators that were less likley to be abandoned.

[13] However, an additional simulation was performed in which the bushel throughout the system was increased to account for the excluded non-Wheat Board grain. See Tosterud [11, pp. 192–195].

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Rail-barge Competition in Transporting Winter Wheat*

L. ORLO SORENSON

ONE OF THE MOST significant and pervasive influences in grain marketing in the United States in recent years has been the growth in water transport capability. In a very important way the pervasive influences have been registered throughout the marketing system by changes in rail rates and services precipitated by intermodal competition.

The completion of the St. Lawrence Seaway 15 years ago brought about the first major rate response from the railroads, which reduced their shipping rate to Eastern export ports. That, plus offsetting reduction to Gulf of Mexico ports, changed structural relationships in grain transportation rates.

In the past decade these river developments have influenced transportation significantly: (a) facility improvement and traffic growth on the Tennessee River; (b) growth in grain movement, especially corn and soybeans, from upper-Mississippi origins to Gulf ports; and (c) development and improvement of the Mississippi tributaries, including the Arkansas River. Grain traffic is growing on each section of the Mississippi and tributary rivers. Between 1965 and 1971 soybeans moved on the Mississippi more than doubled, reaching a total of 8 million tons. In 1971 total wheat, corn, sorghum grain, and soybeans moved on the Mississippi River was 21.9 million tons; on the Illinois, 8.1; on the Ohio, 3.0; on the Tennessee, 2.7; and on the Missouri, 1.3 million tons [5]. However impressive, those statistics greatly understate the total influence of river traffic.

Barge rates and water-compelled rail rates have shifted locational advantage of marketing and processing facilities. Flour mills relocating because of changes in transportation rate relationships is a vivid example. Shifts in relative transport costs also quickly change regional advantage for farmers. Kansas farmers, for example, shift to feed grain and livestock production more quickly than they otherwise would when rail freight rates for wheat rise. Mississippi River barge rates and competitive trainload rates on corn and soybeans have increased the relative proximity of Midwest corn and soybean growers to export markets and have improved the alternative of cash grain sale relative to other production and marketing choices in Iowa and Illinois.

Currently we have 68 Class I railroad companies in the United States [2] that also have territorial or regional identification. Structural changes in rate systems affecting grain flows variously affect individual rail carriers. Railroads are reluctant to change specific rates in part because they desire to maintain an established competitive balance among rail carriers.

Rail grain rate systems initially grew out of efforts by competing market centers and competing railroads to gain access to grain traffic at stabilized transport rates. Stabilized grain rates helped the railroads avoid the consequences of ruinous competition. Equalized rates from major origins to major destinations resulted, with prominent consideration given to equalizing access to grain hauls by competing railroads.

Moving wheat from the Great Plains to eastern and southern destinations has resulted in equalized rail rates over broad areas, from and over river crossings to points beyond—for example, from Sioux City, Omaha, and Kansas City over Chicago, Peoria, and St. Louis to eastern destinations, and from Kansas City and Omaha over St. Louis and Memphis to the Southeast. Rates for highly circuitous hauls on point-to-point movement have equalized with those for short-line hauls. Grain and grain product rates have been equalized. On at least one occasion, internal rail rates have been used to offset differences in ocean freight rates to foreign ports—to equalize total cost of export movement through competing U. S. ports and over rail lines serving those ports [9, p. 145].

Rail rate systems, thus, have been influenced greatly by intramodal competition but not by intermodal forces. Regional rate bureaus facilitated the working out of rate proposals among rail carriers that have resulted in relatively stable structural arrangements. The Inter-

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state Commerce Commission has provided the means to formalize and crystalize rate arrangements so that stable rate systems can be maintained in an otherwise unstable pricing environment.

Actual and potential water competition has upset the delicately balanced system of transportation rates with dramatic (sometimes traumatic) effects on grain marketing. Abrupt, substantial rail rate adjustments have had major impact on the railroads.[1] In adjusting to water competition, railroads have attempted to reduce cost through such innovations as the covered hopper car. For a 500 mile haul, in the Western rate region, calculated variable cost per hundredweight on through train movement is 4.6 cents lower for a covered hopper car than for an unequipped boxcar, based on ICC rail carload cost scales for 1970 [8]. Allegedly, unit train shipments also significantly influence cost reduction, although to my knowledge documented evidence on to what extent that is so is lacking.

Railroads show a remarkable ability to charge "what the traffic will bear," but their ability to reduce rates and continue service is not unlimited. For some agricultural commodities, railroads have passed from a position of major hauler to one no longer being a serious competitor for traffic. Livestock and, to a slightly lesser degree, fresh meat are examples.

Evidence of the railroads' ability to respond to intermodal competition is found in rail cost structures. Rail costs include many fixed costs because of terminal, track, and right-of-way investments that do not respond to traffic changes. Water carriers have no comparable investment. Hence, rail carriers, whose variable costs are a much smaller percentage of total costs than are those for water carriers, have a cost-based pricing range available that is not available to water carriers (or motor carriers) except in the very short run. Where demand for rail transport permits, a larger than proportional amount of fixed cost will be recovered. Rates relative to variable costs, therefore, vary widely.

To help us understand rail and barge cost and rate relationships, I have compared rail and barge costs for wheat movements from Kansas City to several points served both by rail and water. I have compared rail rates and barge rates on a point-to-point basis, and also I have compared rail rates with rail carload variable cost for point-to-point movement to various river and nonriver points. I want to emphasize that my comparisons relate to winter wheat only. Although transportation characteristics are similar for winter and spring wheat, corn, soybeans, and grain sorghums, rail and water transport networks serving various areas of surplus production are quite different. In reporting on his extensive efforts to measure transport demand elasticities and cross-elasticities, Perle noted a lack of uniformity in his results and concluded that "there are numerous transportation markets in the United States and these are all subsets of a larger market" [4, p. VII]. Agencies serving the winter wheat area are a subset. Economic/competitive relationships within that subset do not apply elsewhere.

Point-to-Point Cost and Rate Comparisons

As reported in literature in transport economics, typical barge costs for moving bulk freight are 3 to 6 mills per ton-mile and rail costs are 12 to 15 mills per ton-mile. In spite of ton-mile cost differences, railroads can compete with barges on point-to-point movement for several reasons: (1) Rail cost structure allows a range of cost-based pricing; (2) point-to-point distances are greater by river than by rail;[2] (3) additional costs associated with transfer from trucks to barges may increase total movement cost; and (4) rail services may be preferred because of size or speed of shipment or because of loading or unloading ability.

According to the Interstate Commerce Commission (ICC), which uses two bases, "variable" and "fully allocated," to report rail carload costs:

> variable costs . . . reflect costs which over a relatively long period, and at average density of traffic, have been found to be variable with traffic changes. They include freight operating expenses, rents and taxes (excluding federal income taxes) plus an allowance for the cost of capital before Federal Income taxes on 50 percent of road property and 100 percent of the equipment used in road service.

Variable cost as determined by the ICC thus may be best described as long run marginal or incremental cost of transporting particular traffic based on average conditions by territory, type of car, and weight of the load with appropriately combined way-train and through-train

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[1] For example, an average 60 percent reduction in rates on grain in *Multiple Car Shipments, River Crossings to the South,* 321 ICC 58 (1963) 325 ICC 725 (1965).

[2] From Kansas City to principal barge destinations, river miles average 60 percent greater than do short-line (Docket 28300) rail miles.

Table 1. Estimated average rail-carload costs (fully allocated and variable) and barge costs for wheat from Kansas City to selected river points

From Kansas City to Selected Points on:	Rail Carload Costs[d] Fully Allocated	Variable	Barge Costs[e]
	cents per hundredweight		
Tennessee River[a]	43.8	30.1	26.1
Ohio and Illinois Rivers[b]	37.8	26.7	22.4
Mississippi River[c]	33.2	22.6	19.9

[a] Decatur and Guntersville, Alabama, and Chattanooga, Tennessee.

[b] Chicago, Illinois; Louisville, Kentucky; Evansville, Indiana; and Pittsburgh, Pennsylvania.

[c] St. Louis, Missouri; Cairo, Illinois; Memphis, Tennessee; and New Orleans, Louisiana.

[d] Calculated from Rail Carload Cost Scales for the year 1970 [8] unadjusted.

[e] Published Barge Rates [10].

mileages. Fully allocated costs are variable costs plus an assigned portion of costs not variable with traffic changes. I have estimated carload cost movements from Kansas City to several destinations also served by water from Kansas City. Other than mileage, no unique factors associated with a particular point-to-point haul have been considered.[3] Fully allocated and variable costs with groupings of hauls, along with average barge costs from Kansas City to the same destinations, are reported in Table 1.

Published barge rates [10] are used as a surrogate for barge costs in Table 1. The inland water-carrier industry is structurally competitive. Entry is relatively unrestricted, and capacity for established firms can be expanded or reduced with comparative ease. Costs are specific to traffic units and hence dominantly variable with traffic volume. Under those conditions, rates over a reasonable period of time would be expected to reflect carrier costs.[4]

Figures reflecting cost relationships (Table 1) are very significant. They indicate that where railroads are in point-to-point competition with barge lines in grain transport, variable costs associated with carload shipment on point-to-point movements are greater than are barge costs. Because barge costs are high on the Missouri River, where the Missouri origins are involved variable rail costs are likely to exceed barge cost by a narrower margin than where other rivers are involved.[5] If rail carload shipments are to compete and cover variable costs, traditional single-car rail rates must exceed barge rates. If rail rates just barely cover rail variable costs, fixed elements of rail-carrier costs in the long run must be borne by other traffic.

For point-to-point hauls considered here, rail rates exceeded barge rates by a smaller amount for destinations in the southern region and Gulf ports than for those on the Ohio and Illinois rivers. Using domestic proportional rail rates, I found that the southeast rail rates averaged 30 percent greater than barge rates on a point-to-point basis in 1972. Trade-reported average transit balance from Kansas City to Gulf ports was 18 percent above the barge rate. In contrast, rail rates to Illinois and Ohio river points averaged 72 percent more than published barge rates. With those rate relationships, between July 1, 1971 and June 30, 1972, wheat shipped from Kansas City to points served by barge in the southern region (including St. Louis) was 49 percent by barge; to Illinois and Ohio river destinations, 52 percent. But shipments to Gulf coast destinations were only 9 percent barge movement. For wheat, observed rail rates apparently can compete with barge rates on general point-to-point movements, although barge movement was small to Gulf ports, with rail rates only 18 percent above barge rates.

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[3] Costs are weighted on a 50/50 carload basis between unequipped boxcars and covered hopper cars. Costs include a terminal charge; a line-haul charge divided among regions, based on relative mileage where interregional shipments occur and based on (1) through-train mileage only, (2) Docket 28300 mileage adjusted for circuity, and (3) net loads of 200,000 pounds for covered hopper cars and 120,000 for boxcars; one intraterminal switching charge per car and allowance for loss and damage. ICC statement 1C1-70 [8] provided basic cost data.

[4] Published rates are not compulsory rates for barges. Sizeable short run variations occur; hence, an equilibrium level toward which charges gravitate is hard to establish. It may be a figure other than the published rate. However, shippers report reduction below published charges occur infrequently for wheat from Missouri River origins. Larger deviations from published rates are reported for other rivers in the Mississippi system. For comparative purposes, published barge rates in Table 1 adequately approximate barge costs.

[5] Costs which I budgeted on six-barge tows on the Missouri River resulted in cost estimates of about 6 mills per ton-mile. Grain barges from Missouri River origins from July 1, 1971 through June 30, 1972, carried an average 1146 tons—about 7.3 ft. draft. With this same draft, budgeted cost for barges moving on the Mississippi River (Missouri River mouth to New Orleans) is about 3.5 mills per ton-mile. More fully loaded barges on the lower Mississippi would move at a lower cost, possibly as low as 2.5 mills per ton-mile.

Rates to the southern region, to St. Louis, and to New Orleans—applied to covered hopper cars, with a three-car minimum—reflect substantial adjustment from earlier rates. Rates for 10 destinations (including nonriver points) averaged 115 percent of rail carload variable costs.[6] Rate/cost ratios to destinations on the Ohio and Illinois rivers averaged 186 percent; those to several nonriver points, both northeast and southwest from Kansas City, to which wheat was shipped from July 1, 1971 to June 30, 1972, averaged 200 percent or more, except for those to West Coast destinations, which were slightly below 200.

Rail Pricing Patterns

As already indicated, railroad cost structure permits substantial adjustment of rates in response to market conditions. Like other firms, railroads consider sales characteristics of their markets, then price their service to maximize their income within some time frame. Market conditions for railroads permit them to differentiate markets and to charge different prices in different markets, based on the buyers' willingness or ability to buy. Rail transport demand elasticity for specific hauls becomes highly significant when pricing conditions, if unrestricted, approach that of discriminatory monopoly. Some rate control is maintained through governmental regulatory measures and the modifying influence of intramodal competition exercised through carrier rate bureaus.

The ICC constrains discriminatory rail pricing specifically by outlawing lower rates on shorter than on longer hauls over the same line and by prohibiting rates considered "undue, unreasonable, or unjust." Rate-bureau action tends to keep regional structures intact or to modify them slowly. Point-to-point rates would appear to be affected by long- and short-haul limitations and, in the shorter run, by efforts to maintain intramodal stability. However, existing evidence suggests to me that over time, rail rate systems become attuned to demand conditions; high rates, measured against carrier costs, then occur where rail transport conditions suggest inelastic demand. Revenue/cost ratios by commodities as published by the Interstate Commerce Commission for a series of years up through 1961 and again in 1966 [7] illustrate a wide range. Cereal crops, for example, generally have high ratios, and fruits and vegetables as a group, characteristically low ratios. Traffic in wheat, a high revenue producer for rail carriers, in several years has produced more total revenue above variable costs for U. S. railroads than has any other single commodity. In 1961 total wheat rail traffic produced revenues 85 percent greater than rail variable costs and in 1966, under slightly different cost procedures, 60 percent greater than rail variable costs.[7]

Geographically, revenue/cost ratios also respond to uneven competitive conditions. Anderson and Mariska [1] reported that in 1966 ratios for wheat shipments from Great Plains states increased progressively from south to north (from 1.4 in Texas to 2.6 in North Dakota and 2.7 in Montana), which they suggested represented a more readily available rail-competitive means of transport for major wheat movements in the southern than in the northern states. They also reported that for shipments to Missouri river terminals from Nebraska origins, revenue/cost ratios increased progressively westward from those terminal markets—a response to decreased intensity of competition from trucks at origins more distant from terminal markets. Nichols and Nelson [3] reported a similar revenue/cost relationship in the Northern Plains states. Unpublished analysis confirms the same relationship in Kansas.

As river developments destined to influence river transportation continue, cost benefit studies on which project development decisions are based must assume, by legislative direction, that transport rates and services from competing modes of traffic are unchanged. We know that railroads through cost structure and their opportunity for market separation can respond directly to new competition. If they do not, additional excess rail capacity is created for rail carriers.

If railroads maintain traffic volume at reduced transport rates, their revenues from grain transport are greatly reduced; if they do not, revenues fall and the cost of maintaining excess capacity is also present. Assuming reduced revenue in either case, how do rail carriers already realizing low earnings compensate for revenue loss? They adjust rates and they seek economies through lower cost techniques (unit trains) and by eliminating unprofitable service (branch line) even in the face of strong shipper opposition.

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[6] Where single-car rates apply, rate/cost ratios closely replace revenue/cost ratios occasionally published by the Interstate Commerce Commission. For the point-to-point movement for which multiple-car rates apply, rail costs are reduced; consequently, rate/cost ratios to those points are below comparable revenue/cost ratios. Using costs appropriate to shipment specifications for the southern region, St. Louis, and New Orleans, I estimated average rail rate/cost ratios to increase from 1.15 to 1.35.

[7] In a recent study for the U. S. Department of Agriculture, Schnitzler and Associates [6] suggested that the level of reported revenue/variable cost ratios is too low because of cost allocation procedures used by the Interstate Commerce Commission; however, regardless of level of ratios, the relative position of wheat places it among the high-revenue producing commodities transported by the railroads.

Rail-service adjustments are difficult for grain industries to adjust to because they have fixed investments and, perhaps more importantly, because they have no fully comparable transport alternative. For example, in spite of complaints of boxcar shortages, we have relied on railroads to provide the flexibility in supplying transportation equipment and services. Comparable seasonal, as well as year-to-year, response to changes in service requirements is not likely to occur with any other mode.

In each submarket railroads will renew efforts to adjust rates to maximize rail income—perhaps even to the point of risking retaliatory rate action by other railroads. Rates will rise most for those grain shippers farthest from river ports where demand for rail transportation is less elastic than for shippers with closer shipping alternatives. In the winter wheat area, with respect to the Mississippi and its tributaries, grain shippers in Colorado, Western Nebraska, and Western Kansas will experience relatively higher rates. In the spring wheat area, shippers in Montana and the western parts of the Dakotas are at a disadvantage. After rate relationships are reestablished, percentage increases in rail rates place high-rate areas increasingly at an absolute rate disadvantage. Shippers farthest from river terminals thus are placed at a disadvantage not only because of distance from market but because the few transport alternatives at their disposal allow relatively high rates. The resulting rate structure raises important questions relating to the shipper's equity and to resource development in the High Plains.

In all other modes of transport, except pipelines, the ways and terminals are developed and controlled by public authority and operated on a basis approaching franchised competition. Similar procedures for railroads would result in drastic structural reorganization but would place railroads more nearly on the same structural basis as motor carriers and barge lines, their competitors for grain traffic.

Transportation Analysis

Transportation changes are felt throughout grain markets both because of the sensitivity of grain flows to changed rate relationships and because of railroads' response to traffic challenges. Transport analysis therefore requires a comprehensive system. Assisted by research contracts with the U. S. Army Corps of Engineers, we at Kansas State University have been collecting data this past year for an analytical model of the transportation network serving winter wheat movements from producing areas. Our linear programming transportation model has 220 supply points representing county origins in Texas, Oklahoma, Colorado, Kansas, and Nebraska and 50 destinations, some of which are intermediate points. Conceptually very simple, the model has tremendous data requirements. We have supplied rates for each mode of transport and for each feasible mode combination for each of the 11,000 transport links in the model.

Rail rates in the model are *ex parte* 267B rates with a 2.5 percent surcharge added. The rates were applicable in September 1972. A truck-rate function was developed from 1972 shipping tickets issued by 16 commercial grain haulers in Oklahoma, Kansas, and Nebraska. A linear function $Y = 4.255 + .07677X$ gave us the best fit.[8] (Y is cents per cwt.; X is miles.) The function was used to determine rate from road miles on each of the 11,000 connecting links.[9] Barge costs were budgeted for each navigation section involved in the model. Cost analysis gave us a basis for establishing rates on existing waterways as well as for developing rates for possible river improvements.

The model is operational. We have used it to run the least-cost simulation for known 1971 supply-and-demand point quantities, and to project transport demand requirements for the years 1980 and 2000, along with projections of supply quantities and demand distribution in those years. Although major differences between actual flows and least-cost flows occurred, as expected, basic results using 1971 data gave us confidence in our model. All mode combinations selected were truck-barge combinations. The computer model showed expanded truck movement to satisfy mill demands within the supply area and to mills in states adjacent to the supply area in some cases. Truck arrivals at final demand points were 31 percent of total volume. In actual flow for 1971, local supply points used trucks for original shipment of only 12 percent of shipments. Barge shipments increased from 7 percent actual to 12 percent in the model, with major increases occurring at Omaha, Nebraska, and Atchison, Kansas, and minor increases at Kansas City and Tulsa. In total dollars, the model showed a shipping bill of $135 million with 61 percent to railroads, 25 percent to trucks, and 14 percent to barge companies.

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[8] Only one-way interstate hauls were used to develop the truck rate function. Duplicate hauls (by the same hauler, between the same origin and destination at the same rate) were eliminated. Standard error of the constant is .1487 and of the distance coefficient, .06282. R^2 is 0.626.

[9] Road mileages were determined with a minimum of mileage table search with the aid of a computer program developed at Kansas State University by Leonard W. Schruber and Joe Tiao.

We foresee many uses for our model in analyzing rail-barge competitive relationships and for other analyses. We have projected transportation needs for winter wheat within the geographic supply-demand framework in the model design. Having projected transport needs by least-cost mode combinations, it is possible to introduce hypothetical changes in the transport structure and identify some of the consequences. Hypothetical changes might include development of the Trinity River for navigation from Dallas to Houston; further extension of navigation on the Arkansas River; or, major channel improvement on the Missouri River. Or, within the existing physical structure in transportation, what would happen and to whom in the whole system if rail freight rates for wheat should be raised or lowered by 5 percent? Or, what would happen and to whom if rail export rates to Los Angeles should be lowered by 15 percent, resulting in a given increase in export movement to the west coast? Those questions we can answer, but at this point only on a least-cost transport basis. Later we hope to specify other economic relationships affecting grain flows and modal choice and bring them into the model.

In summary, such major changes as waterway improvements to extend water transportation affect agriculture; they affect competing agricultural areas differently; and they affect competing carriers. The relationships and interrelationships between agriculture and the transport system must be understood more fully by agricultural economists if we are to help farmers and agricultural marketing firms to adjust to changes and if we are to contribute to solutions to what has been called "the transportation crisis in rural America."

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Sectional Meeting C

GRAIN HANDLING AND TRANSPORTATION

Discussants: John R. Felton, University of Nebraska; Gary G. Storey, University of Saskatchewan

Sectional Meeting D

THE FARM MACHINERY INDUSTRY IN NORTH AMERICA

Chairman: George Irwin, ERS, USDA, North Carolina State University

The Farm Machinery Industry: Reconciling the Interests of the Farmer, the Industry, and the General Public

Clarence L. Barber

When I agreed in May 1966 to become a one-man Royal Commission to investigate the farm machinery industry, I also accepted very broad terms of reference. Thus, I was asked to consider and report on factors affecting the price of machinery and parts to the farmer including financing, distribution, and servicing costs; the cost to the Canadian farmer compared with the cost of similar equipment in other countries; and the present and prospective competitive position of the Canadian agricultural machinery industry in North American and world markets. Other terms asked me to examine the historical and present relation between the price and productivity of machinery and to recommend measures that would improve the efficiency and competitive position of the Canadian industry and its ability to provide service and machinery to the farmer at favourable prices.

As I began to examine the task before me in some detail, it soon became apparent that the research program required was very broad indeed, for the major companies engaged in supplying machines, service, and parts to Canadian farmers were large multinational enterprises that produced and sold machinery on a North American and to some degree a worldwide basis. An investigation confined to Canada alone would have been a very limited and inconclusive one. Key problems that required investigation were the role of international trade, the impact and significance of research and development, the industrial structure, competitive behavior and performance of the industry, and the locational factors determining the source of machinery manufacture. The Commission also gave considerable attention to the development, impact, and determinants of farm mechanization. Finally, there were a variety of other problems such as repair parts service, standardization, warranties, and dealer capability, all of which loomed large in the eyes of the farmer.

At the time the Commission was getting organized, North American universities were just entering a period of rapid growth so that capable and experienced professional personnel were extremely scarce. For that reason, almost by necessity, I had to operate with a small corps of capable professionals and supplement their work with contracts to individuals and consulting firms. Some of those involved were able to spend several summer months at the Commission's offices in Ottawa.

By tradition, Canadian Royal Commissions hold public hearings. These were held in the early spring and autumn of 1967 and proved very valuable as a source of insight into and information on the industry's operations and problems. In the main, farmers, farm organizations, and provincial governments appeared in the spring and the major companies in the fall. By bringing to light major problems as viewed by farmers on one side and industry on the other, the hearings served an important educational role in addition to providing valuable information for the Commission. The picture of the industry and its problems was rounded out by visits to manufacturing plants in Canada and the United States and by a major tour of manufacturing plants and research and testing facilities in Western Europe. Now for a brief look at some of the Commission's findings.

First, let us examine the market structure and competitive behavior of the industry. Characteristics of the industry on both the demand and cost side have discouraged the entry of new firms and contributed to the high level of concentration that exists for a number of major products [4, 5]. On the demand side the highly seasonal nature of sales and their erratic year to year fluctuations have favoured the growth of

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the large international company which can sell in a number of different market areas and thus achieve a more uniform sales level. For a number of important products some 70 to 90 percent of Canadian sales occur in a three-month period. For the large international firm the leveling out of sales and production provides them with lower costs than can be achieved by the small firm selling in a single market. The comparatively slow longer term growth in demand for farm machinery has also discouraged the entry of new firms.

Because many farm machines are complex durable products whose timing in use is often critical, provision for service and the supply of repair parts is an essential component in the successful sale of farm machinery [4, 5]. The major companies all maintain their own branch house distribution system and sell their products through franchised dealers whose operations are closely supervised. The companies support their dealers in many ways, through special training programs for dealer personnel, by managerial advice, by the provision of service manuals and advertising material, and most important of all, by providing a stock of machines to the dealer on a fairly long term interest-free floor planning basis. Since dealers are discouraged from handling competitive products of other companies, any new entrant to the industry faces a major barrier in the form of the cost and effort required to develop a distribution network. Sales through independent wholesalers tend to be limited to simpler products where provision for emergency repair parts service is less important. In recent years, too, company finance plans, which allow the franchised dealer to sell to the farmer on credit, have been used to support the competitive position of the major companies.

On the cost side, the importance of economies of scale for tractors, combines, and other products has made it difficult for the smaller firms to compete effectively with the largest firms in the industry [1, 4, 5]. Estimates of economies of scale for tractors were made by a large management engineering firm working closely with Commission staff. This study showed that for tractors, manufacturing costs decline about 20 percent as output increases from 20,000 to 90,000 tractors a year. As a result, a factory price that will yield a plant producing 20,000 tractors a year a return of about 12 percent on invested capital will provide a 33 percent return for a 60,000 unit plant and a 45 percent return for a 90,000 unit plant. Data for combines are less precise but here, too, economies of scale appear substantial. For a plant producing only 5,000 combines a year, unit manufacturing costs are estimated to be 15 percent higher than they are at 20,000 units per year. Rough estimates indicate that economies of scale are also important for activities beyond the plant level, activities such as research, managerial expertise, finance and wholesale distribution. These economies relate to total firm size rather than to the production volume of a single product line. Our estimates sugggest a decline of 20 percent or more for these costs as a firm's output increases from $100 million to $450 million annually.

Thus, at both the plant and firm level, economies of scale are a significant barrier to the entry of new firms. Three plants of a reasonable efficient size could supply all of North America's current annual requirement for wheeled tractors. Two or three plants could produce all the combines that are sold annually.

These barriers to the entry of new firms have contributed to the high degree of concentration that exists for many of the industry's major products [4, 5]. Thus, the four leading firms in the industry account for 67 percent of tractor sales in Canada, 69 percent of combine sales, and 69 percent of the sales of haying equipment. Each of these figures is an average for the period 1957 to 1967.

Although barriers to entry are substantial, they have not prevented new firms from entering. Indeed, in the Canadian market, the share of the Big Three—International Harvester, John Deere, and Massey-Fergusson—has fallen in almost every major product line over the decade ending in 1967. The Commission concluded that this decline has been partly due to the fact that the major firms have maintained prices at levels high enough to attract new entrants or to allow smaller firms to expand in spite of the barriers to entry that exist. However, high prices have typically not shown up as high profits, for the major firms have not fully utilized the economies of scale that are potentially available. Barriers to entry can protect inefficiency and high costs of production as well as high profits.

Support for this thesis was provided in the Commission's *Special Report on Prices* [7]. This evidence showed that profit margins were particularly large on the higher horsepower tractors. Over the period 1962 to 1967, the sharpest decline in the market share of the four largest firms was in the 40 to 70 horsepower range. Some of this decline reflects the success with which different firms have developed and marketed their larger horsepower models, the area in which demand in North America grew most rapidly. But it was the existence of high prices in relation to costs that permitted the smaller firms to compete in this area. Thus, Commission estimates indicated that prices prevailing in Canada in 1967 for a 90 horsepower tractor would yield a before tax return on manufacturing assets of 60 percent in a plant producing 90,000 tractors a year, 49 percent in a plant producing 60,000, and 26 percent for a 20,000 unit plant. In contrast, North American producers at all three output levels would suffer losses on a 40 horsepower model. Tractors in the under 40 horsepower size range which are sold in Canada are mainly imported from Western Europe. In the 1968 selling season, tractors imported from Europe were being sold at net wholesale prices to dealers that ranged from 30 to 45 percent higher in Canada than on identical tractors being sold in Britain.

Major companies avoid price competition for fear of provoking retaliation and lower profits for all concerned. These firms concentrate instead on various forms of nonprice competition such as the development of improved products, an increased number of sizes, options, and models for each major product line, better repair parts service, more emphasis on quality reflected in improved warranty provisions, and on the extension of customer credit. Smaller firms place more emphasis on price since their price cuts are less likely to produce a counteraction by the major firms. For North America it seems clear that Deere is the price leader for tractors and a number of other farm machines and has set prices which not only enable it to earn a high return on its manufacturing assets but have also allowed smaller firms to survive.

Product improvement has long been a major characteristic of competition in the farm machinery industry and over time it has yielded very large benefits to society generally in the form of lower production costs in agriculture. In an earlier period many new machines depended mainly on the inventive ability of individuals, but today the research and development expenditures of the major companies are very large in absolute terms (Deere alone spends more than $45 million a year) and are likely to be the major source of improvements in the future [4, 8]. Unless the smaller companies are supported by a larger public expenditure of funds in this area, they may face increasing difficulty in competing effectively with the industry's giants. New product developments are a particularly effective form of competition because they can offer a farmer a cost reduction at the farm level that will outweigh any compensating price reduction that firms with unimproved products can afford to make. However, the industry's practice of licensing new developments to other firms with a lag of a year or two prevents large company to company shifts in market demand. Not all research and development expenditures result in genuine benefits. In recent years there has been an increasing emphasis in the industry on new models and on providing a greater range of sizes and options from which the farmer can choose. In an industry where output volume is often too small to yield individual firms the full benefit of the lower costs that go with large-scale production, this emphasis on more options, sizes, and models has further fragmented production and added to the underlying cost of farm machinery. It is a kind of development that is only possible in an industry where price competition is under restraint.

All the full and long line companies place a major emphasis on organizing and developing a network of dealers to distribute their products and provide follow up service. Farmers in turn have an important interest in obtaining advice on their new machine purchases and in having access to prompt and efficient service when their machinery needs repair, especially when a breakdown occurs at a critical timing in their seeding, haying, or harvesting operations. The farm machinery companies have been placing a major emphasis on improving the service provided by their dealer organizations, but unlike some other suppliers of farm products, they have done little to develop an advisory service capable of giving the farmer competent advice on machine capacity, operating characteristics, and other technical aspects of the farmer's investment decision.

To the machinery companies, the dealer network is a major component of their sales effort. Sales quotas are worked out for dealers and they are encouraged to carry large inventories of the company's machines on their premises. The sale of competitive products of rival firms may not be actually forbidden but it is actively discouraged. Dealer sales activities are closely supervised by company representatives who may even assist in making sales.

On the basis of this analysis, what can we say about the industry's performance? An evaluation of performance is primarily concerned with the industry's efficiency and progressiveness over time. Efficiency will be reflected in production costs, product prices, and profit levels. Progressiveness will be reflected both in the improvement of the industry's final product and in the productivity gains achieved by the industry over time.

At the manufacturing level there is evidence that the industry has not fully utilized the economies available from large scale manufacturing. One estimate prepared for the Commission suggested that North American tractor production costs would be reduced by about 8 percent if tractor production were concentrated in a smaller number of larger plants [5]. This would reduce the price of an average-sized tractor at the factory level by about $400; similar savings may be available for combines and some other products. Examination of the existing structure of plants in the industry suggests that other kinds of inefficiency may also exist. Plants representing older technologies—with layouts that are poor by current standards, with high costs for handling materials, and lower overall productivity—have survived in the industry. At least in part, this survival has been possible because prices have been kept at levels that are high in relation to manufacturing costs in a new plant of optimum size.

On the other hand, a number of firms have redeveloped their resources more efficiently on an international basis and by expanding into related fields have obtained some of the additional volume needed for lower production costs [4]. Many of the newer tractor plants constructed in recent years have been in Western Europe, where, prior to the recent successive devaluations of the American dollar, manufacturing costs were substantially lower. In 1968, Commission estimates suggest that tractor manufacturing costs in Britain were about 25 percent lower than those in Canada or the United States at similar output volumes [7]. However, the benefits of these lower costs have been passed on to consumers in North America only to a very limited extent. The major portion of the tractors supplied to North American farmers are still manufactured on this continent. And those that are imported are sold at higher prices than in Western Europe. For combines there is also a small import from lower-cost sources in Belgium and Germany. And within Western Europe, production by some of the major companies, such as Massey-Ferguson, is fragmented among different plants. The result must be higher costs than an efficient structure of plants would make possible.

At the dealer level, the industry has moved a long way towards a more efficient organization of resources [3, 4]. Most farm machinery is sold by dealers that have reached an efficient size. While many small dealerships remain, their aggregate sales are small. Moreover, small dealerships may be inevitable in sparsely settled areas. Thus, the potential gain that could be made by concentrating farm machinery sales into fewer and larger dealers is probably small.

In contrast, at the wholesale distribution level there are still significant savings that could be made [3, 4]. Some of these reflect savings that could be made in the costs of dealer supervision if the companies concentrated their sales into a smaller number of larger dealers. However, in recent years the reduction in dealer numbers has been proceeding apace and some of the potential savings may already have occurred. There is also reason to believe that the practice of floor planning new machinery on an interest-free basis for up to 12 months in the case of tractors and 23 months for other machines has added unnecessarily to the cost of distributing farm machinery. The major companies may find the practice useful as a device to keep their machines on view near the farmer and to avoid loss of sales from temporary shortages, but the extra cost resulting from the practice must be absorbed by the farmer. Some indication of the potential importance of this factor can be gained from the fact that for the period 1963 to 1967, and with the data based on a consolidated statement including finance subsidiaries, for every $100 of net sales, Deere and Company held assets of $133 of which $105 were accounts receivable or inventories and only $22 were net fixed asset [3, 4]. Introduced at a time when interest rates were low, floor planning costs have escalated rapidly as interest rates have risen.

Profit levels fluctuate rather widely in the farm machinery industry, but on the average they have been moderate compared with those earned by other manufacturing industries [4, 5]. Between 1948 and 1957 the industry in the United States earned an estimated average rate of return after taxes of 4.6 percent on total assets compared with 5.0 percent in all manufacturing. Between 1958 and 1965 the comparable returns were 4.8 percent and 6.2 percent respectively. However, the moderate overall returns may include high profits on tractors and combines and much lower profits on other products. Profit rates are also affected by the very large distribution assets carried by the industry, either directly as inventory or indirectly in the form of accounts receivable from dealers and farmer customers.

Profit rates have varied substantially among different companies but are now significantly lower than they were before the Second World War [3, 4]. Deere and Company has been consistently able to earn a much higher rate of return than other major firms in the industry. Profits have often been very low for some of the intermediate sized firms such as Case and the firms later acquired by the White Motor Company (Oliver, Cockshutt, and Minneapolis Moline). In general, the evidence is consistent with the hypothesis that the leading firms in the industry have maintained prices that are high in relation to the costs of a large-volume operation, and this has permitted the smaller firms to survive. In Canada, some of these smaller firms have maintained a significantly higher profit rate than that of the major firms. However, profit rates in Canada are difficult to interpret accurately because they are heavily conditioned by the transfer prices used by the major firms in shipments from their manufacturing plant to their wholesale division and because of the large differences in the extent to which products are imported, exported, and manufactured in Canada or in the United States and Western Europe.

As noted earlier, research and development expenditures in this industry are large and have increased significantly over the past few decades [4, 8]. The resulting improvement in farm machinery has contributed to a very large reduction in labour requirements in agriculture. As farm machines have steadily become larger, more complex, and more sophisticated, the introduction of new features or machines has become increasingly dependent on the expenditures of large companies. New developments in the past have often originated in the ideas of individual farmers and this still occurs. And companies of modest size often make important contributions. But the balance of advantage appears to be swinging to the major research and development establishments maintained by the larger companies.

Although the contributions of the industry have been important, it is not easy to evaluate them against a scale of what they could have done. If the major companies are open to criticism, it is in respect to their slowness in moving into more basic types of research. But in this area the efforts of our universities and governments have been sadly deficient as well.

While precise evidence is lacking, it is my view that the industry has greatly improved the quality of its products over the past few decades. Warranties are now available on most, if not all, farm machines, and over time these warranties have been improved and extended. All the major companies have laboratory facilities in which they carry out extensive tests on the materials and components that go into their machines and test facilities for their final machines. Failures still occur, but substantial progress has been made.

On concluding this evaluation of the industry's performance, it will be useful to consider briefly the direction in which it would seem desirable for the industry to move. Would the farm machinery industry be better able to supply the farmer with a quality product at reasonable prices and maintain a continuous flow of improvements if, like the automobile industry, there were just three or four full line firms in the North American industry instead of eight or nine? It is clear from the evidence that a number of the full line firms today do not have enough sales volume on tractors, combines, and other major products to achieve adequate economies of scale. As a result their production costs on many machines are from 10 to 20 percent higher than they need to be. Even some of the largest firms such as Deere and International Harvester do not have a sales volume on tractors and combines that gives them the full advantage of large scale production.

On the other hand, unlike the automobile industry, the farm machinery industry produces a very diverse range of products. The industry structure that would achieve the maximum economies of scales on tractors may not be suitable for tillage equipment or other machines. Moreover, there is some evidence that many important innovations have come from smaller firms [8]. A solution providing more of the economies of scale that come from larger volume production, yet not sacrificing the variety and competitive challenge provided by eight or nine rather than three or four full line firms, is for more integration on an international basis. Some of this has already taken place.

Before turning to another major aspect of the Commission study, namely the competitive position of the Canadian sector of this industry, let us consider recommendations of the Commission, recommendations that were designed to induce the farm machinery industry to adopt policies oriented towards lower costs and lower prices. Because Canada is just one segment of the large North American market, with many of the farm machines sold in Canada being manufactured in the United States and a major part of Canadian production being sold outside Canada, it is no easy matter to devise measures that will have substantial effects. Thus, many of the following recommendations would clearly be more effective if adopted in the United States as well.

(1) The government should prohibit the floor planning of new and used farm machines on an interest-free basis in the hands of the dealers. This would need to be supported by a ban on consignment selling and a minimum interest charge on company financed sales to their dealers. Such a measure would force dealers to give more consideration to the interest cost of the inventory they hold and should make it easier for short line firms to compete with well-established long line firms.

(2) Steps should also be taken to increase the availability of finance to farm machinery dealers. An Act providing for insuring the risk on bank loans to farm machinery dealers comparable to that now provided under the Farm Improvement Loans Act is also recommended.

(3) Agreements that require dealers to handle only the machines of the company in question, known as exclusive-dealing agreements, should be made illegal as is already the case in the United States.

(4) Mergers that are likely to lessen competition significantly in the farm machinery industry should be prohibited, unless it can be shown that the merger would have important cost savings effects and that, in addition, there was reasonable assurance that the cost savings effects would be passed on in substantial measure to the farmer.

(5) The Farm Improvement Loans Act has undoubtedly facilitated the growth of Versatile, C.C.I.L., and a number of other smaller firms by making it relatively easy for farmers to receive bank loans to finance their machinery purchases. Thus, it is important that the regulations under this Act be such as will give the chartered banks and other financial institutions an incentive to compete actively for this business.

Let us turn now to the Commission's examination of the competitive position of the Canadian industry and to the request that it recommend measures designed to expand the efficient production of farm machinery [2, 4]. In examining this question it is useful to distinguish between Canadian firms that are subsidiaries of major international enterprises and the smaller independent Canadian firms. The former group currently account for about 80 percent of the value added by the industry in Canada and have long held a dominant position. There is also some reason to believe that the major international companies have been gaining an increasing share of the world trade in farm machinery. However, a number of the independent firms have enjoyed rapid growth in recent years, and their share of Canadian output may be increasing.

For the subsidiaries of the major companies, any decision to expand Canadian production will be made in the context of an assessment of the world-wide interests of the international company. In the short run, this decision may be dominated by the availability of productive capacity in one country rather than another. But, in the longer run, these international enterprises can be expected to locate their production in the lowest cost country, taking full account of manufacturing costs, transport costs, tariffs, and various production risks, and including an assessment of prospective changes in these costs in the near term future. In a jet age these global corporations find it increasingly easy to use their management, marketing, and research skills to source machines and components from the lowest cost location on a world-wide scale and to market their products on a broad international basis.

However, for newer products initial production will often be located close to the research and development unit where the product was designed and developed. New products often go through a period of progressive development in their early stages of use, and it is economical to keep the factory responsible for them close to the design engineers who originated and developed the basic idea. Thus, one way to influence the location of manufacturing is to influence the location of research and development units. Moreover, given the strong labour saving emphasis that characterizes many new developments in farm machinery, these new products often find their earliest acceptance in high labour cost areas. Thus, for these companies the key to expansion in Canadian output lies in the encouragement of more research and development in Canada.

The independent Canadian firm will usually view the production location decision from a much narrower viewpoint. Until a firm reaches a size where a subsidiary manufacturing plant in another country becomes feasible, it is likely simply to expand their original plant. Given the cost advantages of their location and the efficiency with which they manage their manufacturing operations, their success is likely to depend largely on their ability to identify markets which they are well equipped to supply. But, in the longer run, the smaller independent firms may be handicapped in competing with the international giants unless they receive some support on the research and development side from government or university research facilities. Another alternative may be some arrangement which will enable them to draw on the research and development of some foreign firm. The recent initiation of combine production by the Winnipeg based Canadian Co-operative Implements Limited using the design and some of the components of the Swedish Volvo is an example of this.

The world market for farm machinery can be conveniently grouped into three major areas —North America, Western Europe, and the rest of the world [4, 6]. At the present time, the first two areas are by far the most important in absolute size with markets in 1965 of around \$3.6 billion and \$2.6 billion, respectively. In the rest of the world the developing areas are an important subgroup. Although their present market is fairly small in absolute size—these countries accounted for just 6 percent of the farm tractors in use in 1966 (excluding mainland China)—it is likely to be a rapidly growing market in the future. Over the past two decades, the market in Western Europe has grown much more rapidly than the North American market, and this pattern is likely to continue for some years to come.

Of these three markets, it is the North American market that is, by a wide margin, the most important to the Canadian producer, and this is likely to continue to be true. Except for specialty products, the European market is likely to be difficult for the Canadian producer to penetrate. Not only are there tariff barriers to overcome, but in addition, ocean transport costs for traffic moving from east to west are higher than in the reverse direction and manufacturing costs have been lower in Western Europe than they have in North America. However, the recent dollar devaluations may have significantly changed this picture. Although it has a comparatively slow growth rate, the North American market is a rich and diverse market and probably has a more rapid rate of new product development and acceptance than is true of other markets.

Moreover, the location of the Canadian industry is still well suited to the manufacture of machinery in the North American market [1, 2]. Although manufacturing plants in Ontario are somewhat away from the centre of the North American market, this disadvantage, in terms of transport costs, is more than offset by lower manufacturing costs. Manufacturing plants in Winnipeg enjoy much lower manufacturing costs than those in the United States and are in a strong competitive position to cater to markets in the western half of the continent. Much of this cost advantage undoubtedly applies to other Prairie locations. At the present time Canadian manufacturing plants account for about 7 to 8 percent of manufacturing shipments and value added by the industry in North America. At the same time, about 12 percent of all farm machinery sales in the two countries take place in Canada and about two thirds of these sales are in the three prairie provinces. Thus the Canadian manufacturers' share of the North American market is well below Canada's share of total sales. Even a modest increase in Canada's share of this market would mean a fairly major increase in total Canadian production. To raise it to 12 percent would require more than a 50 percent increase in total output.

When one examines the pattern of production of the four leading manufacturers of farm machinery in Canada—Massey-Ferguson, International Harvester, Deere, and White Motor— it is clear that there are wide variations in the share of their North American sales which they choose to source from plants in Canada. The reasons for this variation are far from clear but may well include both historical development and company philosophy. Of these four companies, Massey-Ferguson provides much the largest share of its sales on this continent out of Canadian plants. Because the total market grows slowly, once a complex of plants has been established, any change in location is likely to take place slowly. In an earlier period Massey's plants catered to an important off-shore market and for this reason its Ontario production facilities were well in excess of what is needed to satisfy the Canadian market alone. And its one major new plant, a combine plant in Brantford, was located there partly because of special tax incentives for locating in areas of above-average unemployment.

For the remaining three firms, International Harvester, Deere, and White Motor, Canadian production as a proportion of the parent company's total North American sales is very much smaller than that of Massey-Ferguson. It is hard to explain on economic grounds this variation in the share of total North American sales sourced from Canadian plants. But, it is probably not accidental that the firm with the largest share is owned and controlled from Canada.

In my view the most important single step that can be taken to induce the larger North American firms to increase their Canadian production is to strengthen greatly the research and development base for this industry in Canada. Up until very recently research and development in agricultural machinery in Canada has been extremely weak [4, 8]. Very little research has taken place either in federal or provincial government establishments or in Canadian universities. And many of the major firms that manufacture in Canada have done a disproportionate share of their research in the United States. This is true even for Massey-Ferguson. With improved support for research, a strengthening of graduate programs in agricultural engineering in Canadian universities, and a greatly expanded research program by the Federal government, the whole atmosphere for research would be greatly improved. The industry should find this atmosphere conducive to an expansion of their own research program in Canada. And an expansion in industrial research could lead in time to an expansion in manufacturing output in Canada.

The smaller independent Canadian firms should benefit from the expansion in Canadian research facilities as well. New developments resulting from university and government research could be licensed for manufacture. In addition, an expanded research program would provide a much larger number of individuals with expertise in agricultural engineering whose services could be drawn upon as consultants or recruited to form part of the permanent staff of these firms. The smaller Canadian companies could also benefit from a greater input of management skills. Their product designs, plant engineering, production control, quality control, and financial management would all benefit from higher quality inputs. One way in which the government could help these firms would be to underwrite the costs of management studies designed to identify areas of potential improvement in their operations and then provide financial support for a limited period to implement the changes recommended.

Finally, a brief retrospective look at the Commission's work may be in order. To what does it owe the success it has had and what would have been done differently with the benefit of hindsight? I would attribute its success to the following points. First, enough time was taken to make an in-depth study of the industry and its problems. If the Commission had been required to report within a year or even two years, the final result would have been superficial in some areas and much less complete in others. Second, I believe a significant part of the Commission's success reflected the input and interplay of personnel with different training and backgrounds. Though the bias was heavily economic, there was an important interdisciplinary content in the research program. Third, a key decision was to sponsor and carry out a thorough management engineering study of economies of scale in tractor manufacturing. This study provided solid data that strengthened many areas of the Commission Report. What would I do differently if I were starting out again today? I would strengthen the agricultural engineering side of our research staff. Beyond that, I have nothing specific to suggest. In the end, I think a good deal of the Commission success resulted from the happy accident that brought a small number of very able people together on the research staff.

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Changing Machinery Technology and Agricultural Adjustment*

G. F. DONALDSON AND J. P. MCINERNEY

TECHNOLOGICAL change can be moulded within very wide limits to suit society's needs. The consequences of changing farm machinery technology for agriculture and rural people, however, are not always benign, and for society are not always beneficial. Since the effects of mechanization derive from its interaction with the institutional structure of agriculture, the resulting adjustments are nowhere the same. Yet, little attention is given to the likely consequences or regulation of technological change in agriculture. The nature of farm machinery technology is shaped in practice by the responses of manufacturers to various forces which impinge upon them. Some policy issues are discussed here in this context, and the implications for the unregulated transfer of Western technology to developing countries is emphasized.

Farm mechanization provides an excellent example of the continual adjustment process, involving people and institutions, which characterizes all growing economies. The mechanization of agriculture has made a tremendous contribution to economic progress, and manufacturers have played a vital role in enabling this process. Yet, when pursuing further mechanization or considering Western experience for application to the less developed countries, it is easy to be dazzled by the possibilities without remembering the difficulties.

Consequences of Farm Mechanization

Advances in both mechanization and in nonmachinery technology have wrought far-reaching changes on farming structure, and on the welfare of farm and nonfarm communities over the last few decades. The result has been almost uniformly the same in all developed countries—a steady increase in farm size, a major movement of people out of farming, and the full development of agriculture as a specialist economic activity, in many cases adopting characteristics (and problems) usually associated with industrial firms. More specifically, this transition has meant that: (1) a whole variety of new inputs has been applied; (2) there has been a progressive improvement in the quality of these inputs; (3) improved production practices have been adopted, and (4) the substitution of machinery inputs has materially altered the input balance. At the farm level this has required, *inter alia*, the revision or replacement of old skills and traditional values, and a major shift in the life style of the farm family. It has also magnified the significance of capital as a factor of production, and has meant a greater dependence on off-farm suppliers for production inputs and expert services.

The primary impact of mechanization on agriculture can be seen through the changes in its input structure. Apart from the obvious emphasis on capital, many other inputs have expanded in use in either direct (fuel, lubricants, etc.) or indirect (fertilizers, chemicals) association with machinery use. Against this, labour inputs have declined markedly. On the other hand, the skills of the farm labour force have probably increased. There have of course been many other adjustments in the input mix for both crop and livestock production.[1]

Mechanization can also be discussed in relation to its profound output effects. Crop yields and product quality have been increased as a consequence of better and more timely operations, and by machine-facilitated use of fertilizer and pesticides. The area in food production has increased significantly, due both to the possibilities of land improvement and reclamation, and to the freeing of land previously given over to maintaining draft animals. In a developing country where food supplies are critical, this can be immensely important; it has been estimated that one tractor can replace some five to eight pairs of bullocks, releasing 10 to 15 acres of land for human food production.

But in the Western world at least, mechanization has also been accompanied by a major structural change towards larger farming units

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* The views expressed here are those of the authors and may not be interpreted as representing the views of any organization with which they are affiliated.

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[1] For a more detailed discussion see [14, pp. 435–459].

and a decline in the number of farms. Disentangling cause and effect in this process is somewhat hazardous, however, for whether increased mechanization itself led to farm enlargement or, conversely, whether larger farms arose for other reasons—such as continuing labour loss—which again necessitated more mechanization is a moot point. But certainly mechanization has been the critical *enabling factor* in the process of farm amalgamation. For mechanization to be a direct determinant of farm growth it must be accepted that: (1) the smaller farmers cannot mechanize effectively and are induced to give up their holdings for economic reasons, or (2) many farmers cannot obtain the machinery of the capacity that they require, or otherwise over-invest in machinery, and are then compelled to expand their land base in order to utilize this capacity efficiently. Both of these arguments hinge on the premise of "lumpy" machinery inputs not easily matched to farm size, and this can be shown to have some substance, especially for smaller farm units [9].

On the other hand, the family farm has shown great resilience and stability, despite the sarcasms of nineteenth-century economists directed at "Jeffersonianism" [20]. To this day some 95 percent of U. S. farms are family farms, i.e., employing less than 1.5 man-years of salaried work per annum, and account for some 80 percent of U. S. farm production. Thus, the expansion of farm size may in the past have been largely a response to strongly-held values concerning family farms, and mechanization merely the means of maintaining these with an increasing level of prosperity and in the face of declining terms of trade. But, if this is so, there is a great irony in the decline in the actual number of such farms necessary to allow a few to survive.

Whatever the truth of the above arguments, mechanization has had a major influence on farm size growth by being the *sine qua non* of large scale production, and to the extent that the results of this development have been beneficial or otherwise, mechanization must therefore take much of the credit or blame. In the context of a labour surplus agriculture in a developing country, this aspect needs very careful attention. While the advent of the tractor may be hailed as enabling greater employment and intensification of production via double cropping, it can just as easily enable the mechanizing farmer merely to duplicate the pattern of his Western counterpart, with little direct effect on output but dramatic reductions in employment [11].

One other profound effect of mechanization has been on the economic nature of the industry and the farm firm. This is seen particularly in the commercialization of agriculture as farms have moved from self sufficiency towards the need to generate a cash surplus to enable the purchase of off-farm inputs. This is again a change of major significance in the process of economic development from a subsistence agriculture base, and it is not always clear whether pressures to mechanize result in a timely encouragement of this change in the agricultural economic structure of many developing countries.

Impact of Changing Technology on Farm Society

The mechanization of production methods must be seen as the prime factor underlying the spectacular change in the farm population—reduced by half—in the last twenty years. Both Canadian and U. S. agricultures have undergone this "shake-out" of labour, involving farmers as well as hired workers, and similar movements have occurred in many other countries. Arguments continue over whether labour has been largely "forced" out or "attracted" out, but the distinction is not particularly helpful. A gap in earnings between farm and nonfarm employment may provide either a carrot or a spur, depending on which rate of earnings is regarded as a satisfactory one, but people may move in response to other pressures.

The social side effects of these changes in farm population have been numerous. With fewer people in farming, and as their proportion in the national labour force declines, there comes a parallel decline in political power, the results of which may be far reaching—both for those remaining in agriculture and those who leave. The change in the age structure of farm people, caused by a higher proportion of the younger people migrating, foreshadows further changes to come in rural society.

The process of emigration is usually a harsh experience for the farm family, as has been well documented [1, 2]. First, there are economic hardships associated with being slowly squeezed out. As the traditional rural fabric starts to disintegrate, these economic hardships are frequently accompanied by wider social consequences, particularly a breakdown of services, including health and education facilities. Thus, children's education and the physical and mental well-being of adults of the family can be affected. Many of the farmers themselves, being over forty years of age and with limited alternate skills, are impressed by a burdening awareness of failure. The subsequent difficulties of the rural-to-urban adjustment add to the price paid by these people for the progress enjoyed by the rest of the farm population and, indeed, the community as a whole.

Although the mechanism is slightly different, there have been even more dramatic shifts in farm employment where hired labour is a feature of the production system, and labour-substituting mechanization can be particularly associated with the changes here. As demonstrated in the case of the tomato harvester, the social impact can be immediate and disruptive [16]. The proposed introduction of mechanized picking of tobacco has also been forecast to have similarly devastating effects in the short run [19]. In a slightly different institutional setting, the social impact of technology has been studied in relation to mechanized cotton picking and associated changes in the Mississippi Delta Area and adjacent areas [6]. In all instances, the changes in employment can be directly associated with the introduction of mechanization in interaction with the prevailing institutional structure of agriculture. Though the process of adjustment differs between these situations, the overall impact in human terms is surprisingly similar to that associated with the decline of the smaller family farms.

Offsetting these population shifts, to some extent, there has been an increase in the number of nonfarm people directly employed in agriculture. Substitution of capital for labour has effectively increased the service force needed. This covers repairmen, technical specialists, sales staff, advisory staff and additional administrative staff, but also includes the increase in the amount of custom work and specialized contract work done on farms. No longer can the total labour force in agriculture be ascertained by counting the number of adult males resident on farms. Apart from the custom work element, the increase in part-time farmers further invalidates a simple count.

Accompanying this out-movement there have been two seemingly anomalous changes in the countryside. One is that many small towns in farming areas have actually increased in population. This seems due to, first, the increase in farm service staff, and second, to the trend towards farmers and farm workers living in town and traveling out to work (another effect of greater mechanization in the form of farm vehicles). The other is that the number of adult males employed per farm has actually increased. In some cases this reflects more intensive operations, especially in relation to livestock, and to the disappearance of small owner-operated units. But it seems, too, that the number of farms large enough to need employed labour has also increased. Such changes in the physical rural scene are highlighted in the more densely settled regions and in the rural hinterland to cities where the former farm-based population becomes replaced by urban dwellers who purchase the vacated rural dwellings as weekend second homes [3].

A more direct impact of expanding mechanization has been on the physical well-being of farm people. Studies have revealed both acute and chronic effects, in the form of accidental injuries and health damage respectively, which are increasing not only in proportion to the farm population but in absolute terms as well [7]. Accidents effect all age groups, but especially the very young and the aged. The chronic effects include hearing damage; various ailments caused by exposure to heat, cold, wind, and dust; and physiological effects due to jolting and vibration. Overall, these adverse effects can well exceed those that are beneficial, such that the reduced exertion and speedier completion of tasks have frequently been offset by more fatiguing operations and longer hours of work.

In these many and various ways the impact of progressive mechanization on farm people can be severe and distinctly unfavourable. The changes that occur in the process of agricultural adjustment create upheaval and uncertainty, so that for many farm people the experience of the times, if not directly detrimental, is disconcerting. Herein perhaps lies the real source of discontent, which sometimes results in machinery manufacturers, rightly or wrongly, being blamed for problems that arise, and which has led to official enquiries into their operation. However, from a broader viewpoint, some concern seems warranted in relation to the documentable evidence of the malign effects of farm mechanization as it reacts with the institutional structure of farming in different situations, especially in terms of the apparent inability of existing policies and institutions to do anything about it.

Few studies have been made of the wider effects of farm mechanization, either physical or social. Social scientists have been particularly remiss in this respect. The study of the likely impact of the mechanized harvesting of flu-cured tobacco stands out as one of the few *ex ante* studies of the social impact of farm mechanization in North America [19]. *Ex post* studies are only slightly more common [6, 16]. The implications have often been most adequately reviewed in novels,[2] though the subject has not been completely neglected by more scientific observers [5, 13]. Even in the labour-surplus developing countries, where the social impact is presently seen in its most dramatic relief, scientific studies are few and far between—though some have been salutary in pointing out the problems in particular situations [4, 18, 22].

Farm mechanization remains largely a *laissez-faire* process in spite of its recognition as a dominating dimension of technological change in agriculture, and of its often dramatic social implications. Despite its benefits, there is evidence that progress in machine technology could be even more beneficial if its development and introduction were negotiated in a more conscious fashion. Furthermore, the costs associated with these developments are sufficiently significant to deserve much more attention from agricultural economists. There are strong *a priori* arguments that suggest these costs could be minimized or offset in various ways if the process of adjustment were fostered within the confines of a more purposive policy.

Determinants of Mechanical Innovation in Agriculture

The forces leading to the development of more mechanized production consist of a freely-acting complex of technological, physical, economic, and social factors. These can be conveniently divided into those acting on the machinery industry and those on agriculture, although the eventual adjustment often depends *inter alia* on the interaction between these two broad entities.

The development of machinery technology is the fundamental factor underlying the growth of mechanized production. Sometimes the development of an implement may be sufficient to stimulate its adoption simply because it is so superior in use to the alternative. This was undoubtedly true of the moldboard plow, the row-spacing drill, and cereal harvesting equipment, in most situations. Similarly, for machines that perform new operations, or operations previously all but impossible, often the mere appearance of the machine will spur its adoption. Engineering research, much of it not specifically oriented toward agricultural machinery, has allowed manufacturers to make advances in all aspects of farm machinery technology, with major refinements to established machines and some entirely new ones as well.

To an increasing degree, however, the farmer has to make do with whatever manufacturers produce. Despite the diversity of agricultural situations, within countries and around the world, the reduction in the number of manufacturers and the growing dominance of a few giants leads to a smaller range and variety of equipment being available. The companies can produce most profitably for large, relatively homogenous groups of farmers; and, while their products meet the needs of many farmers in this way, others are less adequately equipped. This is very apparent in the developing countries where farmers (and governments) have, in many cases, no option but to accept what is available—even when it is not well suited to their needs and situation. In general, as the numbers of small farms progressively decline, manufacturers perhaps find it less profitable to cater for this contracting section of the market. Thus, new machinery lines of suitable capacity and cost for the small farm unit are not developed, further underlining the competitive disadvantage of the small farm and hastening its decline.

But, as well as having advancing mechanization "pushed" at them from manufacturers, farmers have exerted some "pull" on manufacturers to develop implements to meet their needs. The diskers and swathers of the Prairies were largely a response to this pull, and often such an innovation has been first invented or improvised by a farmer. As an extension of this interaction, the tomato harvester is described as the result of a systems approach by a multidisciplinary team to produce a machine to meet a specifically identified need at the farm level. Larger farmers have continually demanded more powerful tractors to pull wider implements, a demand that the manufacturers have shown themselves ready to satisfy.

Progress in the nonmachinery technology of agriculture has also been a causal factor in the growth of mechanization, since it creates new productive situations which often need, or can benefit from, associated machinery. The benefits of research into fertilizers, herbicides, and pesticides could never have been exploited without the appropriate machines for their application. The breeding of monogerm beet, the results of crop response to fertilizer placement, and the advent of silage for fodder conservation have encouraged engineers to develop machines for exploiting these new techniques. In some cases, such as the breeding of even-ripening crops and fruit of even size or skin strength, biological developments have been sought specifically to permit mechanization—sometimes at the expense of quality and flavour. Another factor spurring the farmer to mechanize is the higher level of risk confronting him in production with increases in yields and the scale of operations. To the extent that machines permit better and more timely control over operations, they can consequently minimize many risks in biological processes.

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[2] For example, see J. Steinbeck, *Grapes of Wrath.*

Faced with a steadily declining pool of farm workers, or at least a growing inability to obtain labour at various critical times of the year, farmers have had to resort increasingly to the mechanization of operations in order to get their work done. Often, however, the economic incentives alone have strongly encouraged this type of substitution, and a number of studies have shown that one dollar incurred on machinery expenses can substitute for as much as $1.50 in wage costs [22].

Pressures to expand output provide further stimulus for mechanization. Higher yields and larger acreages increase the burdens of handling. The possibility of higher cropping intensities also gives rise to pressures for further mechanization. Indeed, in private terms, investment in farm machinery is often more profitable than in any other farm input. While it is undoubtedly easy for an individual operator to become "over-mechanized," this does not seem true in the aggregate. In some developing country situations the private benefits of tractor ownership exceed 100 percent per year [11].

The availability of finance for medium-term investment is clearly an important conditioning factor in the growth of farm mechanization. The provision of credit for this purpose is one of the few cases where outside institutions participate in the relationship between the farmer and the manufacturer in the process of mechanization. Where facilities have been inadequate, the machinery companies have often become financing agents themselves.

Farmers' attitudes, reflecting those of society, may also foster mechanization. The possession of farm machinery is one visible means by which status and achievement (and "modernness") can be made apparent. Thus, prestige is a factor even if profitability were not. A positive attitude to machines and equipment is fostered by the imagery and ethics of the modern world of science and technology. Thus, these attitudes also pervade the thinking of development specialists and large farmers in labour-surplus developing countries, where the economic benefits of mechanization may be much less certain.

Just as the farmer responds to various influences in adopting farm mechanization, so does the farm machinery manufacturer. Although these may not frequently affect the level of mechanization, they certainly influence its form and direction. The machinery companies attempt to influence the rate of mechanization through various means—especially by advertising, provision of credit, production of new models and new types of machinery, and by pricing policies. It is not uncommon for substantially different prices to be charged on different markets [15]. This is done in the search for revenue maximization and also as a means of fostering the development of a market.

Competitive influences between manufacturers are among the most pervasive in shaping the direction of farm machinery development. These cause some companies to specialize in particular lines of machines (short-line companies), while others produce a range of equipment competitive with the size and capacity of other manufacturers (long-line companies). The number of firms producing for specialized local or production needs grows smaller every day.

Manufacturers are also affected by external influences, such as the competitive element between firms in similar types of manufacturing for production inputs, including technicians. They are also influenced by the research and development activities of parallel industries, which are usually beneficial but sometimes detrimental in causing almost too rapid changes in technology. The companies are also subject to some official regulation of their activities, such as the "farm machinery acts" of various states and provinces in the U. S. and Canada, respectively. Like other manufacturers they are also subject to labour laws, import regulations, and taxes and tariffs [14]. Despite these several forms of interference, however, the process of farm mechanization is subject to less official intervention than most other aspects of agriculture. Very little public funds are spent on research and development related to farm mechanization. Those that are spent amount to less than 10 percent of the agricultural research budgets in both Canada and the U. S., and the total is miniscule in proportion to the amounts spent by the farm machinery companies themselves [14, Ch. 17]. Apart from the few attempts at regulation, previously mentioned, which relate mainly to problems of service and spare parts, there is little intervention in the relationship between manufacturers and farmers—surprising, perhaps, in a society where concern over consumers' interests is so topical.

The Nature of Technological Change in Farm Machinery

Stated at its simplest, technological change is often characterised as being "output increasing" or "cost saving." Mechanization in Western agriculture is commonly viewed as being cost saving because of its dominant role in taking the place of labour inputs. While there have been major increases in output, much of this is attributable to nonmachinery technology with mechanization playing an enabling role in the process. On the other hand, many advocates of mechanization in developing nations implicitly assume that its effect will be directly one of output increase, and they justify the adoption of mechanized production by emphasising the effect it can have on expanding food crop production. In so far as the possibility of major disemployment of labour which is already underemployed is discounted, a cost saving effect is not held as a prime justification for adoption.

At a more fundamental level, it becomes obvious that such distinctions are not particularly meaningful. However we characterize the phenomenon, technological change is essentially a process whereby the productivity of resources are changed—a situation which can be represented in conventional production economics terms by a shift in the isoquant map "inwards" towards the origin. Because technological changes can impinge differentially on the productivities of different factors, it is common to identify particular changes as being "factor-neutral," "capital-using," "labour-using," etc. Mechanization technology is generally regarded as being a capital-using, i.e., labour-saving, type of shift. However, since technological change is merely a change in relative factor productivities, such a categorisation is descriptive of the actual adjustment only when all other things remain constant. If output changes, or relative factor prices change, the actual employment levels after adoption of the new technology may well differ from those implied by this simple labeling of the change. For example, as seen in Figure 1, the "capital-using" technical change under constant factor prices leads to the normal rise in capital employment and fall in labour employment, i.e., a shift from a to b, when there is no change in output; on the other hand, the employment of both factors can rise if output also expands, i.e., moves from a to c. Alternatively, if output remains constant and the relative labour-capital prices change, increased capital use can be encouraged even under the "old" technology (prices change from P_0 to P_1 in Fig. 2) or the "capital-using" nature of the new technology can be neutralised (prices change from P_0 to P_2).

These points are critical to the interpretation of past technological changes and to the framing of a policy towards guiding future changes. First it is arguable that since, by definition, technological change means an increase in resource productivities, no such change can be *intrinsically* bad; if resources and the services they produce are scarce, any change which raises their productivity can be but potentially benign. What is needed is to direct these changes along lines that produce the most desired effects with respect to factor employments, distribution, etc. Thus, any of the observed harmful effects of technological change can be held as arguments against the manner in which the changes were

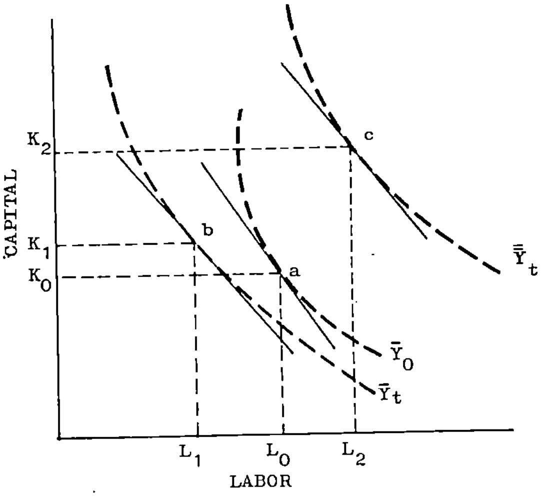

Figure 1. Resource use adjustment following "capital-using" technological change—constant factor prices

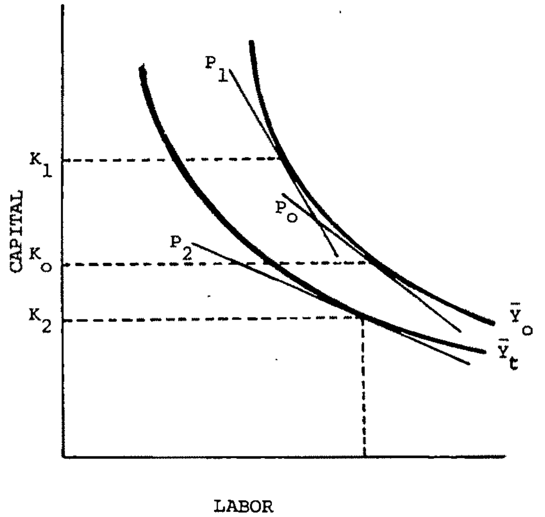

Figure 2. Resource use adjustment following "capital-using" technological change—changing factor prices

allowed to proceed, rather than against the technology shift itself.[3]

This then becomes the basis for a more positive attitude towards technology management in the agriculture sector. Especially in developing countries, where generations of dramatic change and adjustment are yet to be experienced, the acceptance of this approach could be profound. Theoretically, if the economic and institutional infrastructure within which an industry operates is appropriately adjusted, then the nation should be able to direct the uptake of new technology so as to avoid (or certainly minimize) unwanted or unexpected side-effects yet still reap the benefits that the advance in techniques can bestow. If the cost of establishing and implementing such a framework exceeds the net benefits, society might be disinterested in allowing the innovation to become adopted.

Thus, returning to an earlier theme, a technological change can be "cost saving" if its uptake is moulded so as to result largely in the substitution of one factor for another with little effect on output; movement from a to b in Figure 1 represents just such a situation and might be illustrated by the adoption of mechanical harvesting equipment. The same innovation can become "output increasing" merely by directing its use in such a way that specific factor substitution is discouraged, the enhanced productivities being realised by increased factor employment and proportionately greater output expansion. The same technological change can be termed cost saving, output increasing, or both. In other words, the introduction of the tractor and associated equipment into subsistence agriculture *need* not lead to labour displacement and farm size enlargement. Rather, it can equally well result in an increased cultivated area, greater double cropping, a major output expansion, and higher farm employment (as the more enthusiastic advocates suggest *will* happen). On the other hand, if the other pathway is preferable and the release of labour into nonfarm activities is the prime objective, the same technology of mechanized production can be exploited to achieve this end. The essence is that mechanized production technology is neither good nor bad *per se* for subsistence agriculture; since it represents a more productive use of available resources it *should* be good, and could be good if exploited appropriately.

If this is so, one may well ask whether the technological revolution in Western agriculture, referred to earlier, need have brought with it the set of consequences already discussed, many of which have been labeled as detrimental or harsh to the well-being of particular groups. In particular, did agriculture have to shed labour, transform its farm size structure, and shift towards an almost "industrial" capital-intensive production process in absorbing and exploiting mechanized technology? Although the contemporary adjustment phase has been characterised by machine technology acting largely as an agent for resource substitution and restructuring, the evidence of the expansion phase (during the latter part of which much basic mechanization was taking place) suggests that had the need—and hence the economic environment, in the form of product and relative factor prices—been different, so too could have been the impact of the technological revolution on the face of agriculture. The pressures felt by the individual mechanizing farmer were not, however, such as to lead him along an "output-increasing" path, but a "cost-saving" one instead.

There are two facets to the labour substitution effect of machinery. The first and most obvious one is the manner in which, at the farm level, the adoption of a particular machine substitutes for hired labour; this explains why the employed labour force in farming has declined over time. Less obvious, however, is the manner in which the advent of new machines substitute for *farm-*

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[3] For a market economy they should be diagnosed as examples of "market failure."

ers, resulting in a decline in the self-employed labour force in farming. It is the latter which (once the available cultivable land is all in farms) results in holdings being vacated so that amalgamation and increase in farm size can take place. The key question is whether the continuing technical change has been such as inevitably to force many farmers to leave the industry.[4] Mechanization is often held to be culpable in this matter, the inference being that the high initial cost and indivisible nature of progressive developments in mechanized production systems have given rise to benefits obtainable only in larger scale production. The smaller farmer, thus placed at a competitive disadvantage with the option of either investing uneconomically in the new systems or of being left employing the "old fashioned" technology, has eventually and inexorably been forced to leave the industry. While the answer cannot be quite as simple as this (the small farmer can presumably avoid excessive capital costs by purchasing second hand machinery, for example), the indivisibilities in the range of mechanized investment opportunities and the lumpy nature of many units and systems suggests that the notion of a minimum efficient size is important, with that size increasing over time as well.

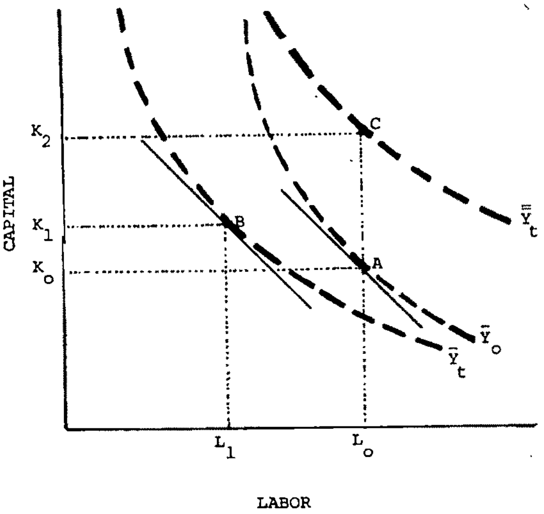

Figure 3. Small farm adjustment to changing machine technology

That this might be so can be portrayed by the following argument. In Figure 3, the isoquant $\bar{Y}_0$ represents the output of a typical small family farm under a "basic mechanization" technology. Given the prices (opportunity costs) of its labour and capital, the family farm's actual equilibrium production position with respect to machinery capital and family labour inputs is shown at A. Given that machinery capital is obtainable only in discrete units, the isoquant is not defined necessarily as continuous for all labour/capital combinations; further, for simplicity, it is assumed that yields remain constant, i.e., output and land inputs bear a fixed relationship to one another. Assuming a "capital-using" technological change in the form of a new generation of more advanced labour-saving farm machines, the isoquant (for the same level of output) shifts to $\bar{Y}_t$ and the most efficient capital/labour combination to B. The economic incentive for this new technology to be adopted is apparent by the lowered production costs it allows, but is B a feasible production position to the family farm? If the new technology can be obtained embodied in a small machine (capital investment K_1), then B is an attainable production point for the family farm—but one which does not fully employ the family labour force. If the family labour force (which in many cases is only the farmer and his wife) cannot be reduced from L_0 to L_1, then the farm must of necessity take one of two distinct choices. Either it retains the old technology at production point A, which leaves it as a higher cost, lower profit firm compared with its adopting competitors, or it adopts the new lower cost production technology but finds alternative employment opportunities for part of its labour supply, i.e., it becomes a part-time farm.

Alternatively, if the new technology is to be adopted and the family labour is to remain fully employed, then the farm must expand its output to $\bar{\bar{Y}}_t$, at production point C. This implies, first, a higher level of capital investment in machinery (K_2), and secondly, that further land must be acquired to allow the output expansion to take place. So, the farm size increases. Such an expansion may be forced anyway by the indivisibility problem if the minimum size machinery system which embodies the new technology requires an investment of at least K_2 in the first place.

In either case the technological change, which apparently only affected the capital-labour substitution possibilities and had no direct effect on land productivity, nonetheless induces an expansion in the minimum size of the farm. Farmers who are forced to give up their land holding in this process are presumably drawn from those who attempt to remain at the less efficient point A, or possibly, because of scale effects for example, from those who find production at point B is less efficient than at point C.

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[4] And, social concern rightly centres on those individuals who changed their livelihood against their will rather than those who moved voluntarily in the quest for higher earnings.

Modifying the Impact of Farm Mechanization

We have argued that all technological change, by its very definition, is potentially of net benefit to society, and so only the latter-day Luddite would wish to bar its introduction entirely. But this is not to say that our attitude should be one of neutrality, with new production technology being developed and adopted quite unregulated. On the contrary, given society's interest in its own advance, it should be vitally concerned in this key process as indeed it is with many industries but not, surprisingly, with agriculture. Such a concern may imply a complex intervention into the existing institutional and economic pattern of the agricultural sector (though what are government policies if not just such an involvement?), with rather different implications for the developed as against the developing nations. In the technologically advanced societies, there may now be little alternative to allowing largely free-wheeling change in response to competitive market pressures, with society stepping in afterwards to correct the major inequities in the distribution of benefits and burdens. But with those developing countries where major reforms of existing patterns and the establishment of appropriate economic and institutional infrastructures is a device already important in economic development policy, the feasibility of such an involvement deserves much closer attention.

In general, intervention can take three different forms: (1) attempting to influence the nature of the technology that is developed and offered to farmers; (2) modifying the economic environment within which a new technology is taken up in agriculture; and (3) adjusting the institutional framework and constraints which govern how the sector adapts to the changes. If we are to modify the impact of technological change, then we need to know much more about it in its specific forms and in particular situations and about using our institutions to participate in the process. Furthermore, where these institutions do not exist—as is all too often the case—they may have to be established, and the need for a range of relevant institutions to intervene in various situations in highly-developed economies has been eloquently proposed by Professor Schultz [17].

Adjustments to the technology package of farm mechanization might involve, first, more government expenditure on research and development to provide forms of machine technology suitable to given situations. In particular, attention might be given to balancing the power and equipment elements of mechanization so that a better-balanced form of technology is available [10]. There seems to be no reason why research and development in this area should be left so substantially to the manufacturers when this is not the case for other areas of agricultural research. Finely-tuned and appropriate machinery packages are extremely important for developing Finely-tuned and appropriate machinery pack- country situations, where the type of adjustment induced by Western technology might be highly disruptive. Development of new, "primitive" technology, in the form of small basic tractors and specifically improved indigenous implements, might be much more appropriate at this stage [12]. Second, it might be necessary to intervene by legislation to impose safety features and health protection. Admittedly, this problem can only be solved in part through such measures, but, in the circumstances, adjusting the machine to the men presents the greatest scope.

Third, it might be useful to allow the farmer a greater say in the development of the machinery he wants. A major step in promoting this exchange might be attained through more detailed and better reported testing and evaluation of farm machinery. While the manufacturer holds all the information, all dialogue must remain one-sided. Better information should also facilitate better decisions relating to farm machinery selection and use [8], and this could effectively change the kind of machinery used on farms.

Fourth, further legislation might be useful in regulating the relationship between farm machinery manufacturers and the farmer—especially in relation to commercial practices, credit, warranties, spare parts and servicing, which all become critical parts of the total machinery package. As machinery gets more complex, the infrastructure and service system necessary to support it grows in size and complexity. Again, these aspects are of great significance to the developing countries.

There is perhaps even more scope in modifying economic and institutional arrangements to mould the uptake of machine technology along desired lines. The first essential is that the price of farm machinery, as a factor, be related to its economic cost. Again, this is of special significance to developing countries, but it applies elsewhere as well. Thus, greater attention needs to be given to tariffs and duties and to the pricing practices of the manufacturers themselves. It also means extreme care in formulating policies which, by grant, subsidy, concessionary credit terms, etc., are designed to foster the acceptance of desired technology changes yet do not unduly warp the requisite balance between the private and social costs and benefits of adoption.

Second, adjustments might be made to land laws to foster the best use of mechanization. Where appropriate, tenant rights might be strengthened or land taxes imposed to encourage the intensification of agriculture rather than its extensification as has often been the case. In some situations, these measures may need to be short-lived, but in some developing countries they might need to prevail for many decades if the replacement of labour is to proceed at a less than catastrophic rate.

Third, there would seem to be a need for programmes to offset the adjustment problems of the rural-to-urban migration. In particular, retraining programmes of the kind provided in other industries would seem useful, since the nonfarming skills of farm people frequently leave them ill-equipped to find urban jobs. However, other social worker and counseling services might also be useful.

Fourth, there is scope for some sort of compensation for persons displaced by mechanization. Frequently the concern for such displaced persons is limited to farm workers; little concern is expressed for the small farmer. Yet, in many instances his plight need be little different from that of the displaced hired hand. Compensation could be paid to the "technological refugees" of agriculture just as to redundant industrial workers.

Our objective is not to make particular policy prescriptions here, but rather to urge a more considered approach to technological change in agriculture. If it is regulated and guided so that the social benefits always exceed the social costs, it is possible, as well as equitable, for those who are disadvantaged to be duly compensated. It is our belief that the dominant role of farm mechanization in shaping our agricultural production and determining the welfare of rural people should be more clearly recognized. Accordingly, mechanization policy should be a primary concern in agricultural sector policy for all countries, and measures should be taken to ensure that change can be effectively regulated. Without this regulation we shall see a continuation in Western experience where the long run benefits accruing to the many result in significant short run costs to the few. Without careful control, we shall see in developing agricultures the opposite situation whereby the short run benefits to the few are obtained at the expense of the long run interest of the many. Neither extreme represents a social optimum.

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Sectional Meeting D

THE FARM MACHINERY INDUSTRY IN NORTH AMERICA

Discussants: Willard F. Mueller, University of Wisconsin; R. A. Benson, Caterpillar Overseas, Geneva, Switzerland; John H. Berry, ERS, USDA

Seminar Session 1.0

EMERGING ISSUES FOR SPARSELY POPULATED AREAS AND REGIONS UNDER A NATIONAL GROWTH POLICY

CHAIRMAN: B. DELWORTH GARDNER, Utah State University

Emerging Issues for Sparsely Populated Areas and Regions Under a National Growth Policy*

LUTHER TWEETEN

SOCIOECONOMIC problems of American society are severe at each end of the population density spectrum. At first glance, the only common element these problems of space and congestion have is intractability. A closer examination reveals a nexus that is political and economic. Sparsely populated areas and regions, acting alone, are neither in a position to solve their socio-economic problems (this paper makes the case that outside help is needed and justified) nor to dictate a political solution at the expense of other sectors. There is merit in finding common grounds with other areas and regions in a national growth policy that would benefit a wide spectrum of the population, yet apply differently to the problems of sparsity and density.

Though some specific legislative proposals have been made [11, 12], a national growth policy remains in a formative stage. Before congealing, it affords fertile grounds for input of economic theory and research. The first objective of this paper is to provide such input. The second objective is to examine how a national growth policy would apply to sparsely populated areas in addressing their perennial problems of human capital outflow, shrinking employment base, high dependency rates, and inadequate or expensive community services. The premise of this paper is that people in low *and* high population density areas have much to gain from a national growth policy of the form outlined herein.

Before turning to these issues, I summarize briefly the economic setting of sparsely populated areas. No attempt is made to review definitively the manifold contributions to the economics of sparsely populated areas reported in publications of the Great Plains Agricultural Council, Western Agricultural Economics Association, the North Central Center for Rural Development, and other sources. Rather, the thrust in this paper is toward less well charted issues posed by a national growth policy.

Economic Setting

Data from the U. S. Department of Agriculture [6, 40] reveal that the incidence of poverty is above the national average in sparsely populated areas, but low income is not the overriding problem found in some more densely populated rural regions such as the Southeast. Outmigration has been a principal means of adjustment to economic realities, and the outflow of human capital has been huge. In the Great Plains states where towns were small and population density was already low in 1940, two thirds of the counties experienced population losses from 1940–60, the same percentage as from 1960 to 1970 [34]. Population losses in the Great Plains were more widespread than in other regions of the nation. Although growth in farm output and manufacturing has exceeded the national rate, the manufacturing base is small and cannot be expected to constitute a realistic alternative to outmigration in vast stretches of sparsely populated areas [4, 15]. The rate of outmigration will continue to be high, but the absolute number of net outmigrants will drop sharply.

National Growth Policy

"National growth policy" is not a growth policy in the traditional sense of more GNP or population. Those who use the term more or less subscribe to conclusions of the national Com-

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* Generous comments of Dean Schreiner, Gerald Doeksen, and Evan Drummond added much to this paper; the author is responsible for shortcomings. Oklahoma State Agricultural Experiment Station Journal Article 2708.

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mission on Population Growth and the American Future that "in the long run, no substantial benefits will result from growth of the nation's population, rather that the gradual stabilization of our population through voluntary means would contribute significantly to the nation's ability to solve its problems." In recognition of the rapid depletion of nonrenewable natural resources, and the folly of counting once as GNP the dollar value of burning air-fouling fuels and again in the dollar value of measures to clean the foul air, national growth policy is not so much concerned with the size of GNP as with the quality of life [see 9]. In recognition of the past failure of the richest nation to end poverty despite adequate national output to do so, national growth policy is more concerned with the distribution than the level of national income. In recognition of low current birth rate and severe problems of providing adequate community services to residents of sparsely populated areas and to densely populated inner cities, national growth policy is more concerned with the distribution of people (and where they can receive adequate services efficiently) than with the number of people in the nation [26].

If there is agreement that problems of environment, rural-urban balance, efficient use of resources to improve the quality of life, and distribution of income are on the national growth policy agenda, there is little agreement on the specific form that policy should take. While continuing articulation of goals and reformulation of plans is inherent in the very concept of a national growth policy, it is also important to recognize that economic theory and recent research results can help formulate a policy. I view programs to enhance economic opportunity in rural areas as an integral part of national policy to foster a more *equitable* and *efficient* economic system. It rests on the judgment that national public policy should first deal with problems of equity through tax, welfare and school funding reform, then deal with problems of efficiency by changing the structure and incentives facing industry.

Equity has two dimensions: horizontal equity, treating alike, with public programs, those in similar economic circumstances, and vertical equity, providing the socially desired distribution of benefits of public programs among income groups. Efficiency means getting more output of goods and services per unit of input, where quantities of aggregated inputs and outputs are weighted by prices that reflect social benefits or costs. The discussion of equity and efficiency issues below is within the context of a national growth policy rather than a policy only for sparsely populated areas, in accord with the premise stated earlier that sparsely populated rural areas have much to gain from a well-conceived national policy.

Equity in a National Growth Policy

It is impossible entirely to separate equity from efficiency. For example, there are advantages in dealing with the low income problem, primarily an equity issue, by applying "efficiency" principles of cost-effectiveness to public policy [37, Ch. 14]. On the other hand, attempts of numerous programs to obtain both economic efficiency and equity obtained neither [37, Ch. 13; 39].

In general, programs that rank high in efficiency measured by cost-benefit ratios or rates of return on investment rank low in equity, defined as providing the most benefits to those with fewest resources [37, Ch. 13; 39]. One of the lessons learned from the war on poverty in the past decade is that it is prohibitively expensive to compensate through remedial education programs such as Head Start and the Job Corps for inadequate genes, family background, ill health, and discrimination that stifled the development of competence. A related lesson is that the schooling has only a minor impact on economic outcomes compared to fate and the home. The nationwide "equal educational opportunity survey" was originated to document the lack of schooling resources devoted to the disadvantaged and rested on the proposition that provision of equal educational opportunity would mean lifting the socio-economic position of the disadvantaged. The findings from the survey eventually led to a very nearly opposite conclusion: providing equal educational resources or even outcomes measured by achievement scores would have nominal impact on narrowing income disparities in the nation [21]. Rates of return on investment in schooling have been found to be favorable [17], and I believe that providing equal educational opportunity is imperative. *But more direct efforts are needed to deal with equity problems.* The following proposals for reform of welfare, school funding, and taxes treat this issue.

Income maintenance

Export base theory, a cornerstone of regional economics, stresses that a region grows by developing export industries, defined as activities that bring dollars from outside a community or region. Welfare reform, with federal takeover of public assistance programs, would bring in dollars and, as such, public assistance may be defined as an "export industry."

The argument for reform rests on grounds of efficiency as well as equity. On efficiency grounds, a given real income can be provided those receiving public assistance at lower costs in rural areas than in the metropolis. People move from depressed rural areas which provide low payments to metropolitan areas where payments are far more generous. Ghetto problems of low incomes, high incidence of welfare, crime, and drugs frequently are associated with residents who one or two generations earlier were living in rural areas which seemed to accommodate such persons with fewer social problems than encountered in the ghetto. New York obviously has a stake in the welfare reform in Mississippi, for example.

States with the least ability to finance an adequate public assistance program also have the greatest need. This factor helps explain why the state of New York provided an average monthly payment of $288 per family on AFDC in 1971 while the state of Mississippi provided only $55. Since rural states have more poverty, lower per capita income, and less federal assistance per needy person than other states [5], they stand to benefit from federal takeover (already underway for public assistance categories other than AFDC) of all public assistance which would equalize payments among states. The past neglect of the rural poor also is implicit in the estimate that of the $3 billion net increase in outlays for public assistance under the Family Assistance Plan, half would go for rural people although rural people comprise one fourth of the nation's population [16]. The working poor, especially prominent in rural areas, frequently have less income than welfare recipients. Major welfare reform proposals include the working poor.

Three major income maintenance proposals are (1) the demogrant plan, which would provide a continuing grant to every person, scaled as deemed appropriate for age and place in the family [28]; (2) the negative income tax [see 32], which would provide a guarantee of perhaps $2,400 to a family of four with 50 cents deducted from that guarantee for each dollar earned by the family up to a breakeven level of $4,800 of earnings; and (3) a wage, or earnings, supplement [14] which would provide a payment of 50 percent of the difference between a target wage of $2.50 per hour and the actual wage. Adoption of any one of these proposals would be a tremendous boon to rural people and would add substantially to the economic base of rural communities. It is now becoming clear that the cost as measured by reduced output of goods and services under a comprehensive income maintenance program is small, probably less than one percent of national income [7, 10].

Communities lagging in economic growth often rely on intergovernment transfers to support local services [see 3]. Categorical grants to communities are inefficient means to help low income people—few dollars trickle down [41]. Target efficiency is much greater if welfare assistance is provided for *families* rather than *communities*. An adequate income maintenance program allows people to decide whether to spend their income for food, housing, or a community water system—a nonexisting option if only a water grant is available. Grants to communities to improve utilities and other services for the purpose of making them more attractive to industry have low target efficiency (many funds go to communities that are unsuccessful in getting new jobs) and should be terminated.

Most payment-in-kind welfare programs for housing and other services have low target efficiency, with a small proportion of the dollars spent on them going to the poor. And in-kind programs with high target efficiency such as Food Stamps and Public Housing could be replaced by an increase in cash income maintenance payments. The justification for payment-in-kind is that low income people spend unwisely and need to have their budget set by outsiders. If competent spending is measured by high budget proportions devoted to necessities such as food, clothing, and shelter, then low income people are the most competent spenders of all. A given amount of real income can be provided to low income people at less cost to the public through cash assistance.

Theory and empirical evidence [23] indicate that the same satisfactions could be provided the poor with substantially less payments in cash rather than kind. Smolensky and Gomery [36] estimated the resource cost of a public housing unit to be $109 per month. Rental payments by residents averaged $44 per month, and the cost to the taxpayer was $65 per unit per month. It was found that the tenants were indifferent between a cash subsidy of $26 per month and the payment-in-kind (housing) subsidy of $65 per month. One conclusion is that the housing program was a highly inefficient way to provide public assistance; it is also well known that such programs are an administrative nightmare.

School funding reform

It is now well documented that outmigration selects toward the young and well educated, hence depletes an area of human resources it can ill afford to lose if it is to attract outside private investment and have progressive local leadership. Outmigration exits vast amounts of local capital. The private cost of raising a rural child (low-cost food plan) to age 18 in the north central region was over $19,000 in 1969 expressed in dollars of that year [31]. With net outmigration of 40 million persons from farming alone since 1929, the human capital outflow approaches $1 trillion—although a major portion of this capital embodied in retiring adults did not generate a future income stream. The public cost of schooling, counting only the local portion financed out of property taxes, averaged approximately $6,000 per migrant. Earnings from that investment accrue elsewhere when the high school graduate leaves.

Two approaches to avoid severe capital depletion exist. It is impossible to avoid outmigration [18], but one alternative is for the community to attract inmigrants who offset the outflow of community capital and who generate earnings to maintain community services. The second alternative is to receive compensation for net outflow of local investment in schooling.

Many communities in less densely populated areas desire to avoid net outmigration and expand their resource base by attracting new industry. Although considerable industry is footloose and no longer tied to traditional natural resources such as minerals, wood, water, and soil as evidenced by the massive development of jobs in Florida, California, and the Southwest where climate appears to be the main attraction, the odds are not with the small community in attracting industry. Currently, three out of four new jobs are in service industries which are either secondary industries such as local government, trade, and services building on basic agricultural or mining activity, or basic service industries that export (bring dollars in from outside regions) and prefer the adequate communications and amenities of the large city.

Thus the community in sparsely populated areas turns to manufacturing industry. The specter of 15,000 local development corporations chasing something on the order of 1,000 new industrial plants a year invites skepticism. Despite the lack of facilities, a large pool of skilled labor, and agglomerative economies, many rural communities are successful in creating jobs in manufacturing, often with home-grown enterprises of which numerous success stories abound. Economists seem bewildered by such local determination to generate jobs, since most communities can ill afford to subsidize industry with low wage labor, tax exemptions, and low interest loans. A closer look affirms the economic rationality of the community.

An Oklahoma study [35] makes a more definitive accounting than do previous studies of dollar costs and benefits to the private sector, school sector, municipal sector, and to the community as a whole from new or expanded industry. Whereas, on the average, the public sectors about broke even (in several cases either the school or municipal sector was made worse off), the private sector realized substantial gains. Annual net gains to the communities from the 12 plants studied averaged $3,772 per plant employee.

On the other hand, the young man raised in the community who leaves after completing high school exits with approximately $6,000 of local capital embodied in him through schooling paid from local property taxes. This human capital may well generate earnings far in excess of the investment made in his schooling, but such earnings will accrue elsewhere. If the choice facing the community is economic progress by adding $3,772 annually through creation of an industrial job or subtracting $6,000 through exodus of a high school graduate, which route should the rational community take? One objective of a national growth policy is to correct for schooling spillover and align incentives so that what is perceived by its residents as good for the community is also good for the nation.

School funding procedures [17, 18] have been devised to compensate for loss of schooling capital through net outmigration. A less complicated approach would be simply for each state and the federal government to assume a large share of the cost of common schools. Compensation for net outflow of capital can be justified on efficiency as well as equity grounds, because communities which experience high net outmigration underinvest in schooling relative to their ability as measured by the percent of local income spent on schooling [42].

Tax reform

The farmer, primarily because of property taxes, pays considerably higher total taxes in relation to his income than the nonfarmer, based on studies in Iowa, Oklahoma, and other states [see 20]. Less reliance on property taxes would raise the disposable income of farmers, but reforms to raise tax rates on capital gains to the level of rates on earnings could offset this gain. Tax loopholes such as exemptions for interest on state and municipal bonds benefit the super-rich. This loophole could be removed and replaced by a federal government subsidy on state and municipal bonds with $2 gained by the federal government in tax revenues for each dollar it would cost the federal government to subsidize state and local bonds at the level of terms currently available. Extended treatment of tax reform issues is found elsewhere [29, 30].

Efficiency in a National Growth Policy

It is my belief that after these issues with primary regard for equity are treated, then other programs and policies should be administered with primary regard for efficiency. Inability to define efficiency within the context of a national growth policy has severely hampered application of the concept to the fundamental issues of our time. Foremost among the efficiency consideration and absolutely basic to economically sound population dispersal policies for sparsely populated rural areas (or any area) is the issue of optimal place of residence.

Optimal place of residence

The issue includes several dimensions: (1) where people vote with their feet to live as evidenced by growth patterns by place of residence, (2) where people vote to live as evidenced by opinion polls, (3) attitudes and satisfactions where people now live, (4) efficient provision of public goods and services by place of residence, and (5) efficient provision of private goods and services by place of residence as evidenced by comparative profit by industry by location.

In general in the 1960's, growth rates were faster for suburbs than elsewhere, and for population centers neither very large nor very small [2, 8]. The relationship between rate of population growth in the 1960's and initial population of communities at the start of the decade is weak at best, however. Even if people vote with their feet to maximize well being, they will not in fact accomplish this for society if institutional rigidities and externalities distort the incentives of firms (and individuals) in making location decisions.

People have not made location decisions consistent with their preferences. A nationwide Gallup Poll [33] in 1972 found that about half of all persons interviewed preferred their current place of residence, but the percentage dropped from 80 to 55 to 39 percent, respectively, from rural to small urban to large urban center residents. Whereas 90 percent of rural residents who were past rural residents preferred rural residence, only 46 percent of the large urban residents who were past large urban residents preferred their current place of residence. Only 27 percent of past rural residents living in large urban centers at the time of the poll preferred to reside in that setting. Moreover, disenchantment with the city is growing. The proportion of respondents preferring city life fell from 22 percent in 1966 to 13 percent in 1972 while the proportion preferring rural residence increased from 49 percent to 55 percent.

The principal reason stated by respondents for not carrying out their preferences was economic. The wishes of the people appear to be secondary—*the location of people depends on the location of jobs (and public assistance) which in turn depend on the decisions made by firms and public officials*. Empirical evidence is mounting in support of this proposition anticipated by Paul Barkley in his statement that "To be employed at all, the book editor must follow his firm to New York even though he himself despises that metropolitan area" [1, p. 201]. Equations accounting for movement of farm labor repeatedly find explanatory variables measuring availability of jobs rather than wage rates to be dominant. Census data [24] again document the dominance of job availability over income levels in explaining gross migration patterns among states.

Before we rush into premature policies to permit people to live in the place of their choice, it is well to examine further the empirical evidence. Four attitudes that relate to well being were found to be, for the most part, unaffected by place of residence but were instead a function of education, income, and occupation [38]. The implication is that place of residence, *per se*, need not be the focal point for centrifugal policies of balanced growth, population redistribution, and decentralization. Peoples' satisfactions will be improved only if opportunities for income, occupation, and education attend a change in place of residence. People will only be made worse off if public policy sends them to sparsely populated rural areas that are unable to provide adequate economic opportunity.

At least two important economic dimensions exist in the location of economic activity so that the limited resources of this nation can provide the greatest real output. One is provision of public goods and services; the other is provision of private goods and services.

The cost of providing a given quality of a large number of public services has been estimated for cities of various sizes by Morris [25]. After accounting for externalities, the least cost per capita is in cities of 20,000 to 1 million residents. Costs in smaller cities and open country are exceedingly high because of the large per capita cost for schools, roads, health care, utilities, and fire protection. Costs in larger cities are high because of the large per capita cost for crime prevention, pollution control, and traffic congestion. Other authors [see 9, 13] have reached similar conclusions on deductive grounds.

The unit cost curve derived by Morris is an average cost for each city size, but a long run marginal cost curve among city sizes. It is a reasonable measure of long run savings in costs of providing community services associated with an incremental shift of residents from one size of community to another. The situation is different in the short run. Because very small communities not only experience economies of size as "plant" is expanded but also have excess capacity, their marginal cost of providing services to an additional resident is low and below the average cost in the short run. On the other hand, larger cities not only experience increasing costs per capita as facilities are expanded but also often have little or no excess capacity, hence marginal costs of population growth are large and lie above average cost. Because towns and cities practice average cost pricing rather than marginal cost pricing, real costs of locating in small places are overestimated and in large places are underestimated, even aside from externalities. The result of these distortions is that firms, jobs, and people have overreacted to centripetal forces and centralization has progressed beyond a socially desirable level.

Although a given quality of community services can be provided most efficiently in cities of 20,000 to 1 million residents, if private enterprise is unable to operate efficiently and make a profit in such places, some other place of residence may be optimal. So we must look to another dimension of national growth policy, namely efficient provision of private goods and services. The issue of efficient provision of private goods and services can be viewed conceptually as a problem in maximizing the real output of the private economy, given transport costs, manpower, technology, and demand. In reality no such optimizing model is operational, and it is necessary to revert to second best empirical procedures.

A study by Janssen [19] examines efficient location of private firms by estimating profit rates by industry by place of residence. Preliminary results indicate that profit rates within a given industry do not differ significantly by city size. While one interpretation of these findings is that industry can locate anywhere and is equally efficient whatever its location, a more realistic inference is that industry does respond rather quickly to comparative profit incentives and locates where it can make the greatest profit. The latter conclusion also follows if firms locate at random and those which do not make profits fail. In any event, overall industry performance appears to be satisfactory: firms locate in a manner consistent with private economic efficiency.

But, the economic efficiency thereof is myopic, equating private marginal costs and returns. If private costs (benefits) differ from social costs (benefits), then superb industry performances measured by adherence to principles of profit maximization and equating of costs and returns at the margin does not maximize social real income. Evidence points to the need to change the structure and incentives rather than the performance of the market to raise social efficiency.

Numerous distortions in the market which impede adjustments optimal from the standpoint of society operate to the disadvantage of rural areas. One element is labor costs. Underemployment exceeds 30 percent in numerous sparsely populated rural counties [22] because rural living is a way of life and people are reluctant to go to large urban centers for jobs, even if jobs are available. In other instances, workers have returned home to rural areas after an unsuccessful stay in the city where they could not get or hold a job because of cultural shock, low skills, lack of experience, and institutional restraints on job entry.

Underemployed rural labor has low opportunity cost because little output is foregone as workers are employed in new local industry. Farm output frequently expands as operators are employed elsewhere and units are consolidated. Minimum wage laws, high costs (including paperwork) for social programs such as social security and unemployment insurance, *de facto* structural wage patterns among industries, labor unions, and concepts of a socially acceptable wage all combine to create inflexible wage rates and to make employers pay actual wages above rates that would utilize underemployed rural labor at a profit. If Ford or General Motors must pay a union wage, then they can most profitably locate their plants in large cities where workers are more skilled than elsewhere.

Another imperfection in the market is externalities. Firms in large urban centers do not pay the full costs of crime, air pollution, and transportation congestion which attends the agglomeration of jobs and people in densely populated areas. If firms in rural areas (or in growth centers of 20,000 to 1 million residents within commuting distance of rural workers) were allowed to pay the low opportunity cost of labor, and if firms in metropolitan areas were taxed for the full social costs of these externalities, the results of the Oklahoma State study indicate that decentralization would be speeded. Some costs of congestion are charged to the firm because workers demand higher wages to compensate for traffic congestion, although workers are constrained in their demands if jobs are unavailable elsewhere. Other costs of congestion do not accrue to firms because, for example, many workers do not accept the fact that their life will be cut short by air pollution.

Programs to improve the mobility of jobs and workers

Based on the foregoing analysis, cities of 20,000 to 1 million constitute the most efficient size range within which to encourage growth. Few such cities are found in sparsely populated regions. In some instances, this means that area employment and population growth should not be encouraged by state or national programs. In other instances, where, for example, a city of 10,000 to 20,000 is the trade center of a large geographic area, it might be singled out as a place to encourage growth. Local analysis by planners can help to select viable cities to use as growth centers. In some instances 20,000 is larger than necessary, in other instances too small for viability.

A system of taxes and subsidies can align social costs (benefits) with private costs (benefits) and create incentives for firms to locate where social efficiency is greatest. Because taxes on private firms to adjust for urban externalities are politically unacceptable, a system of positive incentives to firms which locate in micropolitan areas is more appealing. These incentives could take a number of forms. I suggest that writeoffs from federal income taxes of locating firms be tied to the degree of underemployment in an area. An alternative or complementary program is to terminate minimum wage laws and replace them with a wage supplement program to accomplish the intent of minimum wages, i.e., provide an acceptable wage to low-skilled workers, since minimum wages in fact do the opposite, i e., they cause disadvantaged workers to be unemployed or to be underemployed in secondary labor markets.

The goal of improving the efficiency of markets calls for a federally funded program of worker relocation financial assistance, counseling, and training in areas that are unable or unwilling to create jobs for local residents. Such programs have been found to have favorable economic payoffs and can direct workers to places where jobs are more plentiful and where adequate community services can be provided at reasonable cost [27]. One major role of economic planning would be to determine the optimal mix of industry location incentives and worker mobility incentives to a given region or multi-county district. People in areas unable or unwilling to provide jobs would be eligible for financial assistance to help workers relocate where jobs are available; areas willing and able to attract jobs with location incentives set at the level necessary to overcome market imperfections would be provided inducements for industry location and job creation.

Local Effort Toward Development

This paper has emphasized federal programs for sparsely populated areas within the context of a national growth policy. Local effort is, of course, also important. Local initiative can either expand the resource base or utilize a given resource base more efficiently. Ways to expand the local resource base through improved farm management, attracting industry, and other means have been discussed elsewhere and will not be dealt with further at this point.

Using community resources more efficiently

Numerous government agencies as well as local leaders focus on raising community real income through more efficient use of resources. The federal-state extension service has helped identify community leaders and community goals and organize for action to reach community goals. State and multicounty planning specialists, the Economic Development Administration, and Department of Housing and Urban Development "701" planning grants have assisted in formulating comprehensive development and land use plans to utilize resources better. Rural zoning to prevent urban sprawl, prohibit nuisance enterprises from encroachment, preserve historic and scenic attractions, and protect farm land while providing for orderly development is receiving wider support from rural people and can raise long run real income through better resource use.

Whatever its economic or demographic circumstances, a community is likely to want efficient delivery of community services. A growing body of literature suggests ways to reduce the cost or raise the quantity (and quality) of services such as schooling, health care, and utilities in rural areas. In the case of health care, approaches are being used such as volunteer ambulance services, prepaid monthly fees for comprehensive health care under group medical practice (health maintenance organizations), helicopter emergency ambulance service, use of paramedical professionals, e.g., former military medical corpsmen assisting medical doctors, registered nurses in remote rural areas tied by space-age communications to medical doctors located at a major medical center, and provision of hospital-type services in nursing homes.

A recurring finding throughout studies of services and local government administration is potential saving from consolidation of units to achieve economies of size. Yet the Census of Governments reported 78,268 governmental units in 1972, a decline of only 3,031 since 1967. The decline was almost entirely attributed to the reduction in the number of school districts from 21,782 in 1967 (34,678 in 1962!) to 15,780 in 1972, reflecting legislative pressures as well as economic advantages from consolidation.

Additional opportunities to save on community resources are available by encouraging farmers to build their new house in town, rather than in the open country, and commute to the farm. The opportunity should be strictly voluntary, but could be compensated from money saved by not having to furnish postal, school bus, and, in some instances, first class roads to farmsteads.

Increasing the efficiency of local resource use is a laudable and continuing need. But my belief is that efficient use of local resources cannot alone provide adequate community services and levels of living for declining rural communities. Outside assistance is essential and justified. Problems and opportunities spill over community, county, and state boundaries in a complex, interrelated political and economic situation characterized by high migration rates, environmental pollution, and other problems which are no respecter of local political boundaries. My belief is that the local government should deal with local problems where possible and that many problems which are internal to metropolitan or multicounty areas can be resolved by expanding political boundaries, without the federal government bailing out the political entity for pockets of problems confined within its boundaries. But, many local problems require regional, state, or national government participation to be resolved.

Growth centers

Emphasis on growth centers in development appears to be dead for now, the victim of misguided metropolitan enthusiasts who claimed cities of 20,000–250,000 were too small for economic viability and rural enthusiasts who claimed cities of that size were too remote, who see no need to focus development efforts into a critical mass and who see every community as an opportunity for job growth. The growth center concept should not be forgotten, however, even if it is not stressed in current legislation. Growth centers offer industry a large pool of labor and other inputs, adequate transportation, markets, and agglomerative economies, as well as cultural and other secondary location advantages. Growth centers offer workers an alternative to the unfortunate "company town" with a single major employer (monopsony); give continuity to employment through having employment alternatives when one firm fails, moves, or exploits workers; and provide potential access to a wide array of quality services at reasonable cost. In this context, it is apparent that sparsely populated areas are at a real disadvantage in expanding their economic base and have a major stake in a national growth policy that also includes provisions for training, counseling, and financially assisting the relocation of workers from communities unable to provide adequate jobs.

Summary and Conclusions

To enhance economic opportunity in sparsely populated rural areas in the face of declining employment in farming and mining requires perceptive leadership, planning, and action. Two approaches can enhance economic opportunity through local action: broaden the resource base through industry or other means and use the existing resource base more efficiently. While local measures are worthy and deserving of full support in their own right, they should not obscure the fact that the majority of communities in sparsely populated areas cannot provide adequate services, including education for migrants who leave, and avoid anomie without outside help.

The federal government, early committed to decentralization as evident in the Homestead Act and use of land grants to finance railroads, later shifted to a powerful *de facto* policy of centralization. Commodity programs for agriculture have pushed from rural areas the small farmer and hired worker, while heavy spending per capita for federal payrolls, procurement of military hardware, airlines, and welfare pulled people to the metropolis [39]. Average cost pricing of community services and failure to account for externalities also encouraged centralization. Strong policies of centralization have speeded outmigration from sparsely populated rural areas and unduly concentrated people in metropolitan areas. Subsidies have been required for both extremes of population density continuum. The growth policy outlined herein calls for an end to centralization policies as well as subsidies that specifically encourage people to live in high cost places.

A case is made in this paper for a vastly simpler yet more direct national growth policy than the existing *de facto* centralization policy and a "Christmas tree" policy which some have proposed. The foundation of the policy is a comprehensive income maintenance program, which rests on the judgment that the nation should first initiate a strong program to foster equity, then stress efficiency in programs of balanced growth using public funds where possible to encourage investment by private industry.

Equity entails providing low income persons with means to avoid deprivation, treating those in similar economic circumstances alike, and compensating for economic spillover. A comprehensive income maintenance program could provide the working poor with incomes at least as high as those on welfare, encourage family stability, maintain work incentives, align payment rates among states, and shift costs to the federal government in recognition of the inability of some states to provide assistance at levels that keep social problems from spilling over into other states. School funding reform could at once provide outlays for an adequate curriculum, align local taxes with ability to pay, compensate schools for net spillout of benefits, and reduce now powerful incentives for communities to seek industry rather than outmigration as a solution to their economic ills.

The above programs emphasize equity; the remaining national policy for rural development could focus on efficiency, improving the market structure and incentives of private industry in making location decisions with maximum free choice left to firms. Incentives to private firms would align social costs (benefits) with private costs (benefits). Means include a system of tax writeoffs to industry geared to underemployment in an area, a wage supplement to reduce the private cost of underemployed rural labor to the real cost, and labor mobility assistance to overcome lack of knowledge, capital constraints and other impediments to efficient functioning of labor markets.

This policy is as notable for what is omitted as for what is included. It calls for people to be free to locate where they want, subject to their paying the social costs as well as receiving benefits of that location. Accordingly, all federal programs that subsidize community services and encourage people to locate in socially inefficient places should be terminated. Federal grants to local governments and organizations for urban renewal, mass transit, model cities, utility construction, and tax revenue sharing obviously have little justification in this framework. There appears to be no more justification for residents of sparsely populated areas to spend $75 each annually (the cost of auto emission control [25]) to clear the air over our largest cities than for residents of these cities to pay additional taxes to subsidize utilities encouraging people to reside in country estates. Since the federal government can borrow or guarantee loans on better terms than others in many instances, concessional loans for water, sewer, electrical and telephone systems and for other infrastructure can be justified.

The grant programs which now constitute the bulk of the rural and urban development efforts are difficult to justify on equity grounds because few dollars reach low income people and are difficult to justify on efficiency grounds because community service grants are not as cost-effective as other means for stimulating economic activity. If communities wish to expand their social overhead capital, they should be free to make their own choice of the level and combination of services they wish to provide, with appropriate exceptions for funding of schools and other services with obvious spillover and ability effects as discussed in the text. But, on the whole, the appropriate national growth policy is to assist viable communities to generate an economic base, then depend on the community to fund local services.

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Seminar Session 1.0

EMERGING ISSUES FOR SPARSELY POPULATED AREAS AND REGIONS UNDER A NATIONAL GROWTH POLICY

Discussant: Paul W. Barkley, Washington State University

Subsession 1.1-Regional and National Public Policies
Chairman: GEORGE BRINKMAN, University of Guelph
Subsession 1.2-Local Policies and Issues
Chairman: LONNIE L. JONES, Texas A & M University
Subsession 1.3-Economic Research and Planning
Chairman: GERALD A. DOEKSEN,
Oklahoma State University
Subsession 1.4-Extension
Chairman: ROBERT ANDERSON, University of Hawaii

Seminar Session 2.0

STRUCTURE AND CONTROL OF AGRICULTURE AND THE FOOD SYSTEM

CHAIRMAN: KENNETH R. KRAUSE, ERS, USDA

Organization and Control of the U. S. Food and Fiber Sector*

R. J. HILDRETH, KENNETH R. KRAUSE, AND PAUL E. NELSON JR.

THIS TOPIC needs no justification. Years of informal discussions, formal seminars, and publications have endowed it with legitimacy. With the use of a dexterous mix of research, administrative, educational, legislative, and judicial processes, society can determine its own economic organization. Such social determinations are not new. Consider what our forefathers accomplished with the Northwest Ordinances of 1785 and 1787, and later with the Homestead Act. Enough people now are aroused to force organizational decisions of a similar magnitude between now and 1985.[1]

Present research and education efforts have not provided the information and insights needed to make such decisions. Thus, this paper attempts to make a start by (1) restating the issue of organization and control of the U. S. food and fiber sector; (2) reformulating existing ideas in a manner which we hope will disturb the mental sets of our colleagues about the organization and control issue; and (3) suggesting possible research and institutional approaches for providing guidance which policy formulators will need to make rational decisions. Obviously, it neither attempts to present an organizational panacea nor reports new data.

The Organizational Concept

We have a rich inheritance of micro-theory which treats economic interaction among firms within markets[2] and decision formulation within firms.[3] Neither of these streams of thought is adequate to deal with the level of economic organization which we treat here. The market structure-conduct-performance approach appears best suited for appraising behavior within rigorously delineated markets and for developing policy with an antitrust orientation. The use of the intrafirm approach, which focuses upon the internal decision process, is ill suited for our purpose.

Although organization and structure are related, they are not synonymous. The organization of a sector consists of the matrix of power centers through which organization is controlled. In contrast, structure consists of the number, size, and concentration of entities which com-

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* The views expressed in this paper do not necessarily represent either those of the U. S. Department of Agriculture, or those of our colleagues who made constructive suggestions—D. M. Bell, J. C. Bottum, H. F. Breimyer, A. B. Carr, Grant Devine, P. L. Farris, K. R. Farrell, M. D. Harris, G. D. Irwin, L. R. Kyle, J. E. Lee, Don Paarlberg, A. B. Paul, D. W. Regier, V. J. Rhodes, W. N. Schaller, Rainer Schickele, J. D. Shaffer, T. T. Stout, W. B. Sundquist, W. F. Woods, C. E. Warne, E. H. Wiecking, G. L. Wunderlich, or our formal discussants—W. P. Falcon, G. A. MacEachern, and A. C. Hoffman. Any remaining errors are ours. The order of authorship was determined by a random procedure.

[1] Today's situation appears incredibly more complex. We recognize we have had substantial changes in our institutions which, while necessary, remain insufficient. Change in organization must start from the organizational format extant at the time of change. The existing laws, rules, and institutions act as both constraints and guides to change. However, this does not preclude consideration of organizational alternatives which might require substantive changes in these laws, rules, and institutions. If we limit consideration only to options that appear feasible under existing laws, rules, and institutions, we could miss the "opportunity boat" completely.

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[2] The contributions of Bain, Cassels, Chamberlain, Hoffman, Nicholls, and Robinson come to mind, along with those of other colleagues.

[3] The writings of persons like Baumol, Cyert, Dorfman, and March illustrate the kinds of contributions to which we refer.

pose the sector. The organizational linkages may consist of markets, or other arrangements for decision formulation, and power transmission, e.g., arbitrage linkages spanning both money and commodity markets. Some structures depend upon particular linkages. For example, the "Classical Perfect Competition Market Model" depends upon market linkages, and these linkages have to possess the familiar characteristics. However, the essence of economic organization and control goes beyond any market, or a particular cluster of markets.[4]

Sector-subsector concepts

In analyzing the economic organization of a sector, it is helpful to examine units smaller than the sector. We propose that the major organizational unit for observation and analysis consists of individual subsectors. Implicitly any definition of a sector or subsector must be arbitrary. We assume the food and fiber sector encompasses all activities involved in producing, processing, and merchandising food and fiber materials.

We agree with Shaffer that "a subsector is a meaningful grouping of firms related vertically and horizontally," but we part company with him when he insists that transactions among firms are limited to "market relationships" [14, p. 2]. Linkages within a subsector[5] can be "market relationships" or a rich assortment of other arrangements, including contracts and government rules.[6] The present organization and control as well as the rates of change vary widely among subsectors. For example, the organizational pattern of the dairy subsector is different from that of the beef-cattle or hog-pork subsector, etc. The distribution of linkages via markets and administrative arrangements also varies among subsectors.

Performance measures to assist social selection among alternatives

If society can invent much of its own future organization, what forms should society advocate? Obviously, there is no single form which best meets the needs of every subsector or those of society, forever or even for now. Fortunately, measures are available for helping society choose among its options and steer its way toward the desired format. We suggest a set of performance evaluation criteria for measuring the consequences of moving toward a particular organization.[7] It essentially is traditional in character and includes technological progressiveness; magnitude and extent of externalities; efficiency; values held by society; and income, wealth, and power distribution.

Society's choice of a particular economic organization for a subsector may not score equally high on all of these criteria. For instance, consumers might choose to support a dispersed open market form of farm production because of its income distribution effects, at the cost of less than optimum resource allocation. While we propose no dramatic weighting system to help resolve such conflicts among measures, we suggest that the measures have to be utilized within both the short and long run contexts. What may appear to benefit the group but injure the individual in the short run, may in the long run benefit the individual as much as or more than the group's short run gain.

Technological progressiveness

Whenever a subsector or one of its components moves toward a more efficient production function, it becomes more progressive. Of course, this disequilibrates the existing resource allocation and jolts it to another equilibrium position. This is an opportunity cost for achieving improved technology. Here we recognize that more efficient production functions are obtained by new management techniques as well as by capital improvements and technological developments. Also, we recognize that technological progress by a subsector or one of its components may result in negative externalities for particular groups, or society as a whole. Thus, a net measure of technological progressiveness is preferred to a gross measure or indicator.

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[4] The recent North Central Regional Extension Publications [12] illustrate current thinking which is moving toward research and evaluation of economic organization that goes beyond the boundaries of a market or a cluster of markets.

[5] Subsectors identify specific economic activities such as cattle-beef, broilers, citrus, and hog-pork. The aggregate of all such subsectors constitutes the food and fiber sector. Components common to each subsector include inputs, farm production, and processing and merchandising of farm products.

[6] In any subsector the allocation of production, and thus assets, constitutes a major problem for the relationship of firms moving toward a highly controlled and integrated organization. Alchian and Demsetz suggest that in theory a firm can do the same things a market does [2].

[7] Robert Olson in an unpublished manuscript [13] has provided an excellent review of performance literature. He differentiates between performance measures most suitable for the study of markets and those best suited for sectors.

Magnitude and distribution of externalities

Both positive and negative externalities are important. The negative are especially hard to internalize. Negative externalities may be large, and the distribution skewed so that the incidence falls upon a small group or an individual. If an organizational alternative cannot provide for substantial internalization of negative externalities, other organizational options likely should be considered.

Efficiency

Efficiency has three dimensions, each of which may be used as a measure. The *technical* dimension is the familiar concept of resource allocation where input and output prices are given. For a particular process this dimension is measured by dividing useful output by total input. The technical dimension is more difficult to apply to an economic organization than to a particular economic process. However, current efforts to evaluate research programs may yield measures that can be redesigned to apply here.

The *economic* dimension refers to the provision of not only the product mix (including product safety and reliability) desired by ultimate consumers, but the timing of such offers. Consumers would obtain their products and services (given resource constraints) when they want them, neither sooner nor later. One constraint of this measure is the income and power distribution. A change in the income and power distribution will result in a change in the real demand of consumers.

The *pricing* dimension reflects the accuracy and the speed with which consumer demand and resource supplies adjust to changes in either or both. Pricing efficiency is possible without economic efficiency. However, economic efficiency appears impossible without pricing efficiency.

An indirect measure of total efficiency, i.e., a combination of all three dimensions, would be an index of consumer satisfaction. Recently such an index has been developed and is being tested.[8]

Values

Values are the beliefs held by the members of a society. Some particular values may be common to members of all subsectors, and each subsector may possess values not held by any other group. We emphasize the values which historically appear to have been held in common by most members of our society, including most members of our food and fiber sector, and each of its subsectors. Of course, each person weighs the same values differently under different circumstances. Also, different individuals weigh the same values differently under the same circumstances. We believe the set of values which John Brewster so clearly identified[9] are still widely held, particularly in farm and rural nonfarm America. While they will influence the choices of members of the food and fiber sector, a competing set of values appears to be receiving acceptance by members of other sectors.[10] The ultimate sector organization will reflect the outcome of the clash between these sets of values.

Income and power distribution

The distribution of income and the distribution of power are interrelated. These distributions are composed of the rate and relative amounts received by the basic factors of land, labor, and capital; personal income and power as they are distributed across the subsector under consideration; and wealth as it is accumulated. Clearly, alternative economic organizations will affect the distribution of income, wealth, and power. Economists do not have the value specifications and weights for identifying the *optimum* income, wealth, and power distribution for any particular subsector or for society as a whole. However, it is of use to describe income, wealth, and power distribution effects of alternative economic organizations. History has recorded that whenever the distribution of income, wealth, and power becomes extremely skewed either toward complete equality or inequality, the sector or the entire society experiences extreme social unrest with resulting problems of economic and social coordination.[11]

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[8] The research for the development of the Index of Consumer Satisfaction was sponsored by ERS, USDA. Reports covering results of pilot tests are included in [18].

[9] Brewster's list of primary values or beliefs included: (1) a person does not merit esteem by self, family, or nation if he places a life of easy ways above love of excellence and a vigorous pursuit of it; (2) all men are of equal worth and dignity; none are wise or good enough to maintain dictatorial power over any others; (3) proprietors or their legal representatives deserve exclusive right to prescribe the rules under which production units shall operate; (4) the individual and his family are responsible for their own economic security throughout life; (5) where dissent occurs, both the dissenter and the group from which he dissents are responsible for seeking modes of thought that can result in reconciliation, or "synthesis" [6, pp. 114–137].

[10] This competing set of values might be described as "elitist" and appears to be associated with some power centers. These clashing values, as succinctly identified by Don Regier, include the following: (1) loyalty to the power group overrides consideration of self and family; (2) men are not of equal worth to the power group—some are expendable; (3) the power group prescribes its own conduct and loyalty codes; (4) self preservation and economic security are attained through the preservation and defense of the power group; and (5) dissent from the codes of the power group is resolved in the light of the preceding four principles.

We are not aware of any broadly accepted set of weights for these measures as they are applied in the consideration of alternative economic organizations. There is no general acceptance that the same weights should apply for each subsector, and also for society as a whole.

Forces Inducing Change in Subsector Organization

Uncertainty, technology, financing, and taxes, each induce change in economic organization, and more often than not, combine their impact. These forces induce change directly by affecting each subsector's linkages. Like all forces, within limits they are guided by socioeconomic policies. Of course, these forces vary in terms of their relative impact both among subsectors and their components. And, they will operate whether or not we attempt to guide them. However, if we recognize them, and apply performance measures in selecting our organization objectives, we are in a position to use them.

Uncertainty

There are many varieties of uncertainty. Some we readily recognize include: (1) business succession, and the time span available for seeking redress of business related injustices; (2) commodity quality, and flows; (3) pricing; (4) inventions and their adoption rates; (5) the emergence of allocative competition from forces and sources exogenous to the subsector; and (6) acts of God.

Let us consider (3) and (5) as illustrations of how these forces can result in changes in economic organization. U. S. business and agriculture are subject to conditions such as price levels, interest rates, and personal incomes which are affected by international developments. With the suspension of gold sales by the U. S. Treasury on August 15, 1971, and the announcement that it would no longer administer the price of gold at $35.00 per fine ounce, a generation of stable gold-dollar prices and exchange rates came to an end [16]. Conditions of the international money and commodity markets are now effectively transmitted to domestic U. S. business and especially the food and fiber sector. The uncertainties of international commodity prices and foreign exchange rates are now a part of the U. S. business environment, along with our historic tariffs, quotas, and trade rules. International monetary conditions require that developments in commodity prices abroad, or in the foreign exchange price of the dollar, be offset by changes in domestic U. S. commodity prices or interest rates.

Subsector actors must cope with such forces as best they can. The rise of many large multinational corporations is one response. Such corporations have adjusted to such uncertainties with consummate skill.[12] Today, even more than previously, large corporations appear capable, more capable than small proprietorships and partnerships, of devising an economic organization for a subsector which can cope with such situations.

Technology

Technology remains a primary force for inducing organizational change, and it undergirds the other forces of change. Its undergirding strength is derived from a set of values that has the greater and more efficient output of goods and services as an end objective. Historically, people have had ingenious ideas, and clusters of technological development have emerged around particular inventions, along with a set of institutions which support individuals and groups who seek new technology. Such processes, however, are not sufficient to develop a coordinated attack on a particular problem of substantial scope since they often are uncoordinated, both within and between the private and public sectors. Any optimal mix is due to serendipity. Direct and indirect financial support is fragmented, as is the conduct of the research. The outcome and consequences often are not projected, if even considered.

Thus, it is not surprising that the adoption of new technologies and their associated economic reorganizations often result in substantial negative externalities which are neither automatically eliminated, internalized, nor compensated for by the adopting subsectors. For example, the growth of multiestablishment and multilocational fruit and vegetable processing companies, in part stimulated by a new freezing process, affected not only the location of all food processing establishments, but the types of plants grown, the planting-harvesting scheduling, and the merchandising practices of several subsectors. The net result included fewer and larger farm firms whose contracts with processors stipulated more processor-directed farm practices as well as a restructuring of merchandising practices at wholesale and retail.

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[11] Note, for example, the various utopian societies of early America, and Russia prior to 1918.

[12] For instance, one executive declared that he was not particularly concerned with the establishment of import quotas upon certain products as their corporation maintained a major share of both the domestic production and the flow of the imports which the quotas would have constrained.

Frequently, negative externalities are borne by members of a particular component either within the same or in a related subsector. However, any skewed distribution of real or imagined injustices is hard to accept, particularly if a burden falls upon a clearly identifiable group. This may partially explain the rise of consumer groups.

Financing

Financing is among the primary forces facilitating organizational change. It is a prerequisite for the development of new technologies and the functioning of programs. Source of financing may lead to adoption of a particular organizational form. Historically, the financing of cotton production by the cotton gins illustrates this point.

Medium and large sized banks and other sources of financing prefer to loan to moderate and large sized corporations rather than to proprietorships, thus encouraging the corporate form of business. Also, the magnitude of the financing needs may require the obtaining of funds directly from the public. Again the corporation is in a favored position.

In the past, the small size of most companies in the food and fiber sector has meant that their capital, beyond their own savings, has been supplied by credit facilities located primarily in rural areas. More and more the emergence of large-scale operations has increased the absolute dollars required by many food and fiber subsectors. Such increases, along with rising land prices, could result in an increasing reliance upon larger nonrural credit sources. Such increases in scale also could result in the consolidation of existing farm firms.

Tax rules

Tax codes and their interpretations steer many available resources to activities which otherwise would be less appealing. The power to tax provides opportunities to create as well as to destroy. Thus, the establishment of investment credit and rapid depreciation rules affected the flow of resources. Among the beneficiaries were owners of department store and office buildings and the petroleum industry. These rules also have encouraged an incursion across subsector and subsector component boundaries that otherwise might not have occurred, or at least not so extensively. The citrus, nut, and broiler subsectors document this historically for the farm production component. Today it appears that the cattle-beef subsector may be experiencing a like incursion from outside the food and fiber sector.

Guiding the Forces Responsible for Change

Policies and their implementing mechanisms, e.g., a Federal Reserve Board of Governors, guide the manner and the extent to which forces responsible for change influence the consequences of alternative organizational linkages for power transmission and decision formulation. In contrast, there are written and unwritten understandings by which men and their institutions operate in the daily pursuit of their interests.

When clearly defined and agreed upon, such understandings become guides for conduct and can reduce the need for, but not totally replace, regulatory authority. Limited administrative interpretation should be needed by parties operating under their guidance. However, we emphasize that the reliance upon self-enforcement of written and unwritten understandings most likely will succeed within a democracy, since democracy is conducive to the care and maintenance of adequate feedback mechanisms.

The establishment and alteration of policies offer subsectors and their components the opportunity to move incrementally toward the organizational format which each desires. Once the society's organizational goals have been established, we contend our "institutional economics cupboard" is rich with possibilities [9]. It is with respect to the implementation of organizational goals by means of policies and the written and unwritten understandings that we make some tentative and suggestive comments.

A number of economists have become particularly interested in property rules, incentives, and economic behavior [7, 15, 19]. Furubotn and Pejovich [7, p. 1139] refer to "property rights" as:

> . . . *relations among men that arise from the existence of things and pertain to their use.* Property rights assignments specify the norms of behavior with respect to things that each and every person must observe in his interactions with other persons, or bear the cost of nonobservance. . . . property rights . . . can be described, then, as the set of economic and social relations defining the position of each individual with respect to the utilization of scarce resources.

The inclusion of property rules in economic analysis changes the theory of production and exchange [7, pp. 1137–1139].

> The organization [firm, government bureau, etc.] *per se* is no longer the central focus; rather, individuals are assumed to seek their own interests and to maximize utility subject to the limits established by the existing organizational structure. . . . the property rights approach can be understood as an attempt to formulate empirically meaningful optimization problems by associating the utility function with the individual decision maker, and then introducing specific content into the function. In this way it becomes possible to consider the behavior of the decision maker within the firm, government bureau, or similar collective agency [or the totality of the economic organization within which all are functioning]. . . . From a practical standpoint, the crucial task for the new property rights approach is to show that the content of property rights affects the allocation and use of resources *in specific and predictable ways.*

These ideas suggest the existence of a wide range of means of implementing the organizational goals for specific subsectors, and for society as a whole. As Wunderlich points out [19, p. 4], virtually all of the analyses of economists take for granted the division of powers and authorities prescribed by the Constitution of the country from which they drew their education and experience. Thus, most ways of implementing policy goals (including organizational) that economists can think of fall within a given set of property rules. For instance, "nationalization of industry" within the United States historically has been unthinkable.

Suppose, for any given subsector, the organizational goal is to keep a large number of farmers and markets with many buyers and sellers for farm produced commodities. Various changes in existing property (control) rules could assist. For example, rules could be established to require processors to procure a specified proportion of their raw farm products (or first level sale of fresh products), through a market with a stipulated minimum number of buyers and sellers, thus preventing complete contract procurement or vertical integration. Control rules also might be developed to require firms of a given size or above to grow *only* by internal means

In contrast to the above illustrative organizational goal, assume the objective to be either an integrated corporate or cooperative economic organization. In this instance the rules would have to be altered substantially. In addition, to obtain a satisfactory subsector performance, such a corporate/cooperative organization must provide incentives for individual employees to achieve that performance. Usually this would require the maintenance of incentives for individuals at different levels of the corporate/cooperative organization. Hence, some method of metering inputs, useful outputs, and related rewards would be required.[13]

Changes in rules that affect information flows have very significant effects upon organization. Many question the adequacy of present information flows for wise public and private policy formulation. For example, the Securities and Exchange Commission is attempting to obtain fuller disclosure of information pertaining to the economic performance of corporations, not only for the benefit of private investors and public policy decision makers but for the maintenance of an effective securities market.

An increase or decrease in market news and price reporting will influence the type of structure that is encouraged—open market, corporate, cooperative, or governmental. For any model of economic organization to perform adequately in our society, rules likely will need to be changed to require more disclosure on the part of large power clusters, as well as more information about the market.[14] Improved information loops and a viable rule structure can help preserve or develop a desired economic organization.

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[13] The concern about what configuration of incentives, rewards, sanctions, and ideology is conducive to responsible individual performance in various forms of economic organization also is treated by Breimyer [4, pp. 2–9].

[14] We agree with Mueller [11] that more and better information is needed if we are either to maintain our present economic organization or to improve it.

Property, income, and capital gains taxes also can be used to help attain the desired type of economic organization. Furthermore, they can be used to enhance overall competition. For example, conglomerates historically have reported and paid their corporation income taxes only upon a pooled income basis, i.e., upon earnings of the company as a whole. An alternative tax rule which would require them to report operating income and pay their corporation income tax *field by field* could eliminate "balancing off" of losses [3].

Adoption of new control rules of the type cited would result in fundamental changes.[15] The ability of a subsector to make these changes depends much upon its basic value structure and that of all other subsectors. For example, consider Demset's suggestion, cited by Furubotn and Pejovich [7], that property rights develop to internalize environmental externalities when the gains of internalization become larger than its costs. The perception of costs and benefits of externalities versus internalization depends upon the view of each subsector, and of society, which are in turn greatly influenced by their value structures. Thus, rule changes can be utilized in an impersonal manner to guide such organizational forces. Their effectiveness depends both upon their clarity and upon their acceptance by members of each subsector and by society.

Research Approaches

Numerous methods are available for quantifying the differences that may be associated with a fundamental change in the organization of a subsector and its components. Three methods of particular interest include: (1) an in-depth appraisal of experience either of another subsector or a component in another country which has undergone an analogous change; (2) a systems approach utilizing rigorous synthesizing and simulation to quantify consequences of adopting alternative organizations; and (3) a Delphi analysis.

Let us consider possible reorganization of the corn subsector. The question might be: what are the potential consequences if the three components of the corn subsector were vertically integrated, with production occurring only upon a few farms or in solar energized greenhouses?

The first approach might consider the historical and analogous experience of other subsectors. Granting important sector differences, useful insights can be gained from the history of broilers and lettuce, or from differences between pork production in the United States and in Denmark. Many economies with longer histories than ours may have relevant organizational messages in terms of already tried alternatives.

The systems approach would enable the simulation of a wide range of matrices of power centers and organizational linkages. The resulting organizational forms could be compared in terms of specific dimensions such as price, quantities supplied, profits, etc. Measures of performance could be developed from these comparisons. A quantification of the existing system could provide a basis for ascertaining the extent and kinds of change that might result from the alternative organizations. Examples somewhat illustrative of this approach include the studies of the Nigerian and Korean agricultural components of their food and fiber sector and the ongoing ERS-university cooperative hog-pork subsector studies [8, 10, 17].

The Delphi approach would involve the independent questioning and requestioning of members of each component of a subsector with respect to what they, individually, would forecast as the consequences of such a reorganization for their subsector and each of its components. Members of the economics, business, sociological, and anthropological "fraternities" would also typically be incorporated in the questioning. A generalized opinion of the consequences of a subsector reorganization could be derived from such reiterative questioning. These results, of course, will differ substantially from those that might have been obtained from a single survey.

In specifying organizations and approaches for research, the following points might be considered: (1) study subsector organizations that include movement from the few to the many, as well as from the many to the few; (2) indicate the probability that each organizational alternative may occur; (3) recognize that the more remote the possibility of a change from one form of organization to another, the greater will be the probability of error in assessments; and (4) identify the secondary effects that may accompany the adoption of a particular organization (for example, the emergence of unionization, or demands for new forms of regulation, either through private associations or public agencies), which often are related to social and cultural aspects of the new organization.

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[15] We do not wish to leave the impression that simply the establishment of rule changes offers a panacea for guiding future organizational change or that the Federal Trade Commission approach is unimportant. Rules can be used to strengthen an "in group's" advantage. Also, we stress the importance of changing rules incrementally. Drastic changes in the "middle of a game" rarely work well. In addition, we stress the difficulty of developing workable rules. We do not contend that our cited examples are workable.

A caveat is in order with respect to organization and control research and education within the food and fiber sector. The food and fiber data system is rapidly becoming obsolete for such research and education.[16] The proposed research and education task will require new, in addition to present, data. The new data will need to be collected and aggregated on a different unit or building block of observation than firms, markets, and industries. We suggest that the subsector might be considered as the basic unit for observation. In any event, unless economists give thought and effort to reconceptualization of the food and fiber data system, their other professional efforts may yield scant accomplishments.

Conclusion and Recommendation

Concern has been expressed about the state of health of the agricultural establishment. In his classic paper, Bonnen put it very succinctly when he concluded, "[The agricultural establishment] must exhibit far more relevance to the broader objectives of society" [5, p. 1129]. While we have argued that in large measure any subsector or sector can invent its own economic organization, we acknowledge that the "invented organization" must not be grossly inconsistent with the broader objectives of the society of which it is a member. We also agree with Bonnen that the USDA's research thrust increasingly has been toward the administrative problems of the "here and the now" for large action programs [5, p. 1120].

There is a need for the universities and the USDA to cope with longer range problems. The appropriate future economic organization of the food and fiber sector and its subsectors and their components has become of paramount importance. Discussions with several colleagues have resulted in our belief that the time has come to create a new collectivity at the national level. Let us call it The National Institute for Food and Fiber Research and Education.

The research and education task, to provide the guidance which subsectors will require to invent much of their future economic organization, is important, massive, and incredibly complex. The task will require far greater coordination of talent and resources than has been achieved so far.[17] The Institute would be charged with the responsibility of (1) establishing research programs geared to intermediate and long-range problems originating both domestically, and from foreign contacts; (2) disseminating results to policy formulating agencies, both private and public; and (3) conducting broad educational programs to increase feedback loops between researchers, members of the food and fiber sector, policy makers, and consumers.

More specifically, the Institute might meter all Federal funds for research and education activities which have a major influence upon the organization and control of the food and fiber sector. It would maintain a small staff of professionals to plan and coordinate the research-education efforts. However, most research would continue to be undertaken by existing agencies, including the universities. The Institute might be directly accountable to and receive its funds from Congress. A new committee might be established to oversee its activities. Hopefully, it would include a cross section of our total society's representatives. It might appropriately be weighted with representatives familiar with the impact of the food and fiber sector upon consumers.

Paramount attention would be paid research related to the information needs of the Congress and the Executive agencies concerned with incremental improvements in the organization of the food and fiber sector and its subsectors. The research also would emphasize longer range problems and impacts associated with the invention and adoption of new technologies, environmental problems of the sector, etc. The output would be the delineation of alternative policies and probable consequences of each. These results would be communicated to the food and fiber subsectors, to the public, and to the Congress.

The alternative to the major thrust which a new Institute could provide is to continue to react too little and too late, with agricultural economists playing an increasingly diminishing role in policy formulation. With sufficient creativity and investment, agricultural economists can assist society in channeling the forces of change to its benefit. The time to marshall the necessary resources and information is now.

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[16] This view's justification is contained in the Annual Meeting's paper presented by the Economic Statistics Committee of the American Agricultural Economics Association last year [1].

[17] The difficult task of obtaining people and funds sufficient to conduct projects of a large magnitude is reflected in the problems encountered in launching NC-117, Organization and Control of the U. S. Food Production and Distribution System.

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Seminar Session 2.0

STRUCTURE AND CONTROL OF AGRICULTURE AND THE FOOD SYSTEM

Discussants: Walter P. Falcon, Stanford University; A. C. Hoffman, Kraft Company (retired), Northbrook, Illinois; Gordon MacEachern, Agricultural Economics Research Council of Canada, Ottawa

Subsession 2.1-Who Will Control Agriculture: Implications of Structural Changes

Chairman: Leonard Kyle, Michigan State University

Speakers: James Hightower, Agribusiness Accountability Project, Washington, D. C.; Gerald I. Trant, Canada Department of Agriculture; V. James Rhodes, University of Missouri

Subsession 2.2-The Problem of Value Determination for Agricultural Commodities

Chairman: Marshall Godwin, FCS, USDA

Papers: Allen B. Paul, ERS, USDA, "The Role of Competitive Market Institutions"

Geoffrey Hiscocks, Canada Department of Agriculture, "Marketing Boards and Pricing in Canada"

Olan D. Forker, Cornell University; Richard Courtney, University of California, Berkeley, "What are the Emerging Options?"

Subsession 2.3-Structural Effects of Federal Income Taxes

Chairman: W. Fred Woods, ERS, USDA

Papers: Marvin Anderson, University of Alberta, "The Canadian Income Tax System and Structural Implications"

H. L. Oppenheimer, Oppenheimer Industries, Inc., Kansas City, Missouri, "A Case for Continuation of Tax Incentives for Agricultural Investments"

Harvey Shapiro, U. S. Treasury Department, "What an Income Tax System Should Do"

THE 1973 FELLOWS ADDRESS

Government and Agricultural Adjustment*

D. GALE JOHNSON

WHEN the new round of GATT negotiations start next month, negotiations on tariff and nontariff barriers on farm products will have a central and critical role. That role may be so critical that if little or no progress is made toward liberalizing trade in farm products, the negotiations will fail. Indeed the tide of isolationism and protectionism may well become so strong that recent trends toward increasing interferences with trade and other international economic relations, evident in the United States for the past five years, will win the day. It cannot be stressed too much that the strongest political support for trade liberalization in the United States comes from certain farm commodity interests. If these interests are thwarted once again, as they feel they were in the two previous GATT negotiations, they also are likely to turn inward.

On many of these issues Canada and the United States find themselves in a similar situation. Both are industrial nations with less than 5 percent of their gross domestic product originating on farms. But because of the organization of their agricultures, based on highly effective divisions of labor and functions, served by efficient input industries and effective marketing services, the percentage of gross domestic product produced on farms greatly underestimates the trade significance of the production of farm commodities in each of the economies. Further, because of enormous amounts of land available, at least on a per capita basis, and the efficiency of their farms and the industries that are associated with farm commodities, in each of the two high income industrial countries farm products have a distinct comparative advantage. Thus both countries stand to lose if there is trade liberalization for nonfarm products and services and none for farm products since they would not have the opportunity to exploit the major comparative advantage that they possess in agriculture.

So far as the GATT negotiations are concerned the major international markets for the farm products of North America are in Western Europe and Japan. Unless Western Europe and Japan significantly modify their tariff and nontariff barriers affecting farm products, many of the possible gains from agriculture's comparative advantage in North America will not be realized.

It is not my purpose to repeat the numerous objections that North Americans have to the trade and farm policies of the Common Market and Japan. Nor do I intend to emphasize the sophistry that North Americans have used in previous trade negotiations, when we have asked for reductions in trade barriers affecting our export products but have not offered significant modifications in our own protectionist measures such as high dairy supports, Section 22, Crowsnest freight rates, high sugar prices, subsidized grain storage, or export subsidies.

My purpose is to examine the fundamental issue that makes it difficult for governments and those organizations that represent farm interests to confront rationally the implications of free or nearly free trade in farm products. I believe that resistance to free trade in farm products is based primarily upon fear—an undocumented fear that free trade in agricultural products would require agricultural adjustment of enormous magnitude and severity.

This fear grows out of two considerations or, to put it differently, there are two ways of interpreting developments in agriculture since the end of World War II. First, in an industrial economy with increasing real per capita incomes agriculture has to (and does) adjust to changing circumstances at what appears to be a frenzied pace, as evidenced by the large annual decline in the farm labor force and in the number of farms. It is argued that if the adjustments

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* The research on which this paper is based has been supported by the National Science Foundation (GS-3071) and the Rockefeller Foundation (RF 63096). Neither is responsible for the contents of the paper. I want to express my appreciation for their helpful comments to Joseph Barse of the Economic Research Service, U. S. Department of Agriculture, and to Harry G. Johnson and Theodore W. Schultz of the University of Chicago.

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required by free trade were added to the already existing requirements for change, they would impose burdens greater than the social and political fabric could withstand.

Second, and quite ironically, the presumed failure of existing farm programs to reduce significantly the income differentials between farm and nonfarm families leads many policy makers in Japan and Western Europe to the conclusion that the lower farm prices that would result from free trade would create great economic distress among farmers.[1] There appears to be an acceptance of the conclusion that farmers in Western Europe and Japan are so inefficient that free trade would result in the virtual disappearance of agriculture and the forcing of millions of farm people off the land and into cities that are already severely overcrowded. Thus, in effect, the failures of current programs and policies are presumed to provide evidence that a very different approach should not be tried, or for that matter, even seriously studied.

As I shall develop more fully later, the agricultural policies of the industrial nations—with their emphasis upon price supports, trade barriers, subsidies, and supply management—have not attacked the problems that are important to the economic welfare of farm people. The primary determinants of the welfare of farm people are the level of national income per capita, the rate of economic growth, the way that growth is managed, and the extent to which farm people are integrated into the economy and society.

Governments have done little to assist farm people in adjusting to changing conditions. Almost all that governments in the industrial countries have done to improve the circumstances of farm people has been outside the framework of national agricultural policy. Thus it is not surprising that national agricultural policies appear to have failed to achieve their objectives. In general, the means used have not been appropriate to the objective, such as increasing the relative level of farm to nonfarm family incomes or reducing income inequality in agriculture.

Ignorance and Agricultural Policy

How real is the basis for the fear that adjustment problems resulting from free trade would impose unacceptably high costs upon farm people? Unfortunately, we have to say that our evidence on this point is rather limited. This limitation is perhaps not too surprising since governments have made almost no effort to determine what effects the existing farm programs have had upon such important variables as net farm income, the return to farm labor, the return to and value of land, the level of farm employment, and the output of farm products, separately and in total. It hardly seems too much to ask governments that spend billions of dollars of either taxpayer or consumer funds to support farm incomes to spend a few millions to determine these effects. Not only have individual governments failed to undertake such studies, but repeated efforts to induce international organizations such as OECD or FAO to undertake them have failed.

What is perhaps even more surprising is that rather little is known about the level and distribution of income among farm families in several major industrial nations. The European Community has recently estimated that about a fourth of the labor force living on farms has nonfarm employment. It is, however, a very rough estimate since for the two countries with approximately 70 percent of the total farm employment in the Community of Six—France and Italy—virtually no data are available. The European Community has made no real effort to determine the economic position of farm families. The reason, so I was told by an important Community official, is that the topic is politically sensitive and for the Community to study independently the incomes of farm people would be considered interference in the affairs of the national governments. Yet the Community proclaims that it must continue the Common Agricultural Policy in order to have satisfactory farm incomes while admitting that it does not know the average level or the distribution of farm family incomes.

In all frankness we must also say that while we have quite good data on the income of farm families, from both farm and nonfarm sources, for Canada and the United States, we are not able to indicate with acceptable accuracy the major income effects of the farm programs of the two countries. While I believe that most agricultural economists now agree that the major income benefits of current farm programs go to the owners of farm land, we have not yet convinced policy makers of this nor have we been successful in showing how small a fraction of the benefits, if any, go to human resources.

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[1] The "presumed failure" of farm programs to reduce income differentials should not be interpreted to mean that there are substantial differences in returns to comparable resources engaged in agriculture and elsewhere in the economy. Most of the income comparisons made by governments are wholly inadequate as a basis for assessment of the effectiveness of resource allocation [6, Ch. 10].

The Elements of Agricultural Adjustment

The conclusion that agriculture, under the best of circumstances, must undergo rapid and continuous adjustment in a growing economy is well established. Why this is true is well known: an income elasticity of demand for output that is less than unity and declining as real per capita incomes increase, the quite direct applicability of knowledge to the farm production process, and the substitutability of inputs, including purchased inputs, for land. These relationships, when taken together, result in a potential growth of supply of farm output that is greater than the potential growth in demand for farm output.

A consequence of the potentially more rapid growth of supply than of demand is that if returns to resources are to remain unchanged, certain resources must be withdrawn from agriculture. Since only a small part of the land is likely to be withdrawn for nonfarm uses, most of the resource withdrawal must be labor. It is conceivable, of course, that part of the reduction in resources could occur through reduced employment of purchased inputs, but it appears that this has not been the case in any industrial country for which data are available. In fact, the opposite has occurred and purchased inputs have increased in importance, both in absolute amounts and as a percentage of total farm inputs.

This simplified exposition of the causes or sources of agricultural adjustment ignores a major determinant of the rate of adjustment required and, I believe, generally achieved. The excluded element was hidden in the phrase, "to keep the returns to resources unchanged."

What this phrase excludes is what my colleague, T. W. Schultz, discussed a year ago at these meetings—the increasing economic value of human time [12]. If the value of human time did not increase, there would be little or no need for agricultural adjustment since the growth in real per capita income and the increasing value of human time are intimately and causally related.

Agricultural adjustment is not a response to a constant real return to labor, but rather is a response to a continuously moving target—the rising value of human time. If the value of human time did not increase in agriculture but did elsewhere, two results would be evident: (1) the annual rate of reduction of the farm labor force in industrial economies would be at about half of its recent rate of 4 to 6 percent, and (2) the disparity in returns to farm and nonfarm labor would grow by 2 to 3 percent annually. Much of the cost of agricultural adjustment is the price we pay for keeping returns to comparable farm and nonfarm labor in some rough balance, after account is taken of the pecuniary and nonpecuniary costs of job mobility and/or migration.

The increase in the absolute and relative importance of purchased inputs referred to earlier is a response to the rising real wages (value) of farm labor as well as the rising real marginal product (rent) of land. Thus imbedded in the adjustment process are adjustments that serve to reduce the equilibrium employment level of farm labor since the purchased inputs are highly substitutable for labor.

The fact that agriculture adjusts to the increasing value of human time means that the conventional methods of farm programs—higher support prices, output restraints, acreage limitations, or input subsidies—will have little or no long run effect upon the returns to labor engaged in agriculture. A product price increase or a given reduction in cropland has a once and for all effect upon the demand for labor and thus upon the return for labor. Even if the elasticity of demand for farm output is infinite, as it is made so by an effective price support that is maintained at a constant level, the shift in demand for labor is a once and for all change. At some time, in fact very soon, it will be necessary for labor to transfer out of agriculture, and the effect of the increased output price (or reduction in land input) on the return to farm labor will have been reduced to zero, though the cost of the price support or land limitation will continue indefinitely into the future.

I have developed this point more fully elsewhere [6, Ch. 9], but at this time it may be appropriate to refer to three studies that are directly relevant. One is by Micha Gisser [2] in which he shows that annual rightward shifts in the demand for farm output of 1.8 to 2.2 percent, with a shift in the production function of 1 percent and a capital formation rate of 2 to 3 percent, would fall substantially short of providing for a 1.6 percent annual increase in the return to farm labor. The needed leftward shift in the supply of farm labor ranged from 0.7 to 5.4 percent annually and this is on the assumption that there was no natural growth in the farm labor force. If the long run elasticity of supply of labor to agriculture is approximately 3 as estimated by Gisser, there is no conceivable shift in the demand for farm output that would eliminate the necessity for some outmigration if the returns to farm labor are to increase at a rate comparable to the increase for nonfarm labor.

An entirely different model developed by Lee Martin [7], also for the United States, can be used to estimate the effects of price changes and reductions in cultivated area on the required reduction in the farm labor force to achieve an annual increase in the gross product per farm worker of 4.4 percent in actual prices. The latter percentage growth rate was for undeflated per capita disposable income between 1946–50 to 1966–70. If farm output prices increased at 2 percent per annum, the required reduction in the farm labor force would be 0.6 percent per annum compared to a reduction of 2.1 percent if product prices were unchanged and 3.7 percent if output prices declined 2 percent per annum.

Martin summarizes the effects of continuous annual reductions in cultivated cropland—up to 4 percent annually—on the return to farm labor and the need for reducing the farm labor force as follows: "Worthy of note in this simulation is that marginal product of labor can grow at the desired rate (0.044) only if the supply adjustment is made through the labor market. If acreage reductions are relied upon to keep supply in balance with demand, the annual increase in the marginal product of labor will not be large enough to keep labor earnings in agriculture from falling farther behind labor earnings in the nonfarm economy."

Wilhelm Henrichsmeyer has developed a model for Germany for 1950 to 1965 with projections to 1980 that shows the relationships between farm labor migration, farm prices, technical change, and farm wage rates [3]. His model indicates that for 1965–80 the farm labor force must decline by 4.5 percent annually to achieve the same rate of increase of wages in agriculture as in the rest of the economy, namely 4.9 percent annually.

One can use his model to estimate the difficulties that would be involved if migration were zero and farm wage rates were to increase at 4.9 percent annually. Assuming no control on output, real farm prices would have to increase by about 2 percent annually. But farm output would be growing by approximately 2 percent more than the growth in demand. If the market for farm output were to clear, farm output growth would have to be held to something less than 1 percent rather than more than 3 percent and real farm product prices increased by about 4 percent annually. To hold farm output growth to less than 1 percent annually would require continuous annual reductions in the amounts of land *and* capital employed in agriculture of about 5 percent.

It is sometimes argued that if the increase in factor productivity were somehow kept small, it would be unnecessary to have such a large outflow of labor from agriculture.[2] Under some circumstances there may be some validity to this view. But the validity hardly extends to the conditions that prevail in the United States and Canada because of the dependence of our two countries upon export markets for such a substantial fraction of total demand for key farm commodities. The price of slowing down productivity growth would be rising costs of production of export commodities and a gradual loss of export markets. Thus agriculture in our countries is faced with declining employment whichever way the fates turn. For some other countries that can insulate their agricultures from world markets, it might be possible for a time to slow down growth in productivity and reduce the required outflow of labor. But here the costs would be high as well. One of the major sources of productivity growth as conventionally measured is the increase in human capital per worker. Do nations wish to limit this growth and thus penalize the farm population for now and the next generation? The other cost is rising food prices and there are surely limits to how far that can go or would be permitted to go.

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[2] Change in factor productivity is here used in a somewhat loose sense, as the change in the ratio of output to total inputs as the latter are conventionally measured. A large fraction of the increase in output per unit of input is due to inaccurate measurement of inputs—primarily the failure to reflect changes in quality of the inputs over time. The measurement of inputs fails to reflect changes in the quality of human resources, and similar measurement errors occur for complex inputs such as tractors, combines, and transportation equipment. But for present purposes it does not matter much whether the shift in the demand curve for labor is due to an unrecognized improvement in tractors or, equivalently, a discrepancy between the measured and the true price of tractors.

Labor Force Adjustment

The critical element in agriculture adjustment is the responsiveness of the farm labor force to economic opportunities. Although there is a good deal of confusion on this point, there is a growing body of evidence that shows clearly that the labor market has changed radically over the past decade or so. And the change has significantly increased the elasticity of supply of labor to agriculture.

Much of the earlier work on the farm labor market, including my own, was strongly influenced by the assumption that the choice between farm and nonfarm employment involved migration—a change in physical location—and that mobility—a change in job—requires migration. As late as 1950 in the United States only 16 percent of the labor force living on farms had nonfarm jobs; there had been little increase from a decade earlier when 10 percent of the jobs held by farm people were nonfarm. But by 1960 a third of all who were living on farms and employed had nonfarm jobs and by 1971 the percentage had increased to 45. Another, and I think rather unexpected, development was that by 1971, 38 percent of the labor force employed in agriculture had nonfarm residence [13]. Thus the isolation of the farm population from nonfarm economic and employment activities that was implicit in much of our earlier work is no longer nearly so valid an assumption.

Obviously something similar has occurred in Canada. In 1971 it is estimated that 49 percent of the total net income of farm operator families came from off-farm sources [10]. This compares with 53 percent in the United States [14]. In the Prairie Provinces 35 percent of the income of farm operator families came from off-farm sources.

Because of the land reform imposed by American occupation authorities, but now so popular and entrenched, there has been little increase in the size of Japanese farms over the past two decades. The farm consolidation that has occurred in North America and to a lesser but still considerable extent in Western Europe has not been possible in Japan. Yet the labor force adjustment seems to be progressing quite smoothly through off-farm employment of farm family members. Out of 16 million farm and nonfarm workers living on farms in 1970, over 8 million had nonfarm jobs (either part-time or full-time) [9]. Off-farm income accounted for over 63 percent of farm family income in 1970; this was a significant increase from the 52 percent from this source in 1965 [8].

The radical changes that have occurred in the conditions of labor supply to agriculture in North America, Japan, and in much, though not all, of Western Europe have not been the result of conscious governmental policy—at least not of policy directed to that end. The change has been the consequence of many aspects of economic growth—lower cost transportation, improved communication, dispersal of employment opportunities, changes in the regional distribution of farm populations, and the near absence of serious unemployment for the past quarter century. Improvements in the education available to farm youth have also been important, though in all too many countries rural educational opportunities still lag behind urban opportunities.

These changes, however, have largely negated the long run effects of the usual farm policy measures upon the return to farm labor. As the elasticity of supply of farm labor has increased, product price increases or input subsidies have two primary effects: increasing output and increasing the return to farm land. The level of farm employment can be influenced by such measures but not to a sufficient degree to have any significant impact upon the return to farm labor.

Another change in economic parameters has occurred that reduces the effectiveness of supply management in increasing the returns to farm labor or other farm resources. As international trade in farm products has increased in importance in North America, the price elasticity of demand for farm products has increased significantly. It is not only the growing importance of exports and imports that has had this effect, but the increase in incomes in the other industrial countries has meant that our livestock sector, even though trade is relatively small, is functioning within the framework of an international market. Thus efforts to manage output, even if successful, will at best have temporary effects on the returns to all resources engaged in agriculture.

Free Trade and Agricultural Adjustment

FAO has recently published projections of the population economically active in agriculture [11]. Admittedly the projections are based largely on recent trends in the farm labor force, population growth rates, and anticipated rates of economic growth, but the results are instructive. Based on what amounted to the assumption that farm policies existing in 1970 would continue, it is projected that the economically active farm population in the EEC (the Six) would decline from 10.5 million in 1970 to 5.3 million in 1985 or by nearly 50 percent. This compares with an actual decline of the farm labor force from 21.5 million in 1950 to the 10.5 million in 1970. For North America the decline in the labor force is estimated to be rather less, approximately a third. The decline in Japan is projected from 10.8 million in 1970 to 5.4 million in 1985, also a decline of half.

Would free trade—or a significant trend toward trade liberalization—significantly increase the required rate of reduction of the farm labor force in the agricultural regions that would import substantially more farm products? In the absence of quite detailed studies of the effect of free trade upon the demand for farm labor, it is not possible to give a definitive answer to this question. Yet based on some quite preliminary explorations, it appears that the fear that free trade in farm products would require an important further reduction in the farm labor force is unfounded.[3]

There is little evidence that the particular forms of protectionism that have been adopted by the industrial countries have been designed to minimize the primary adjustment problem of agriculture, namely the need to reduce the farm labor force. If policies were so designed, protection would have favored products that were labor intensive and would have neglected, at least relatively, products that were labor extensive. With some notable exceptions, to be noted later, the farm policies of the industrial countries have favored farm products that are labor extensive and land intensive. This is shown most clearly by the Common Agricultural Policy, but it is also evident in North America. The major protection of agriculture in the industrial countries is for crops, especially the grains. Livestock products, except dairy in North America and Australia, have generally received much less effective protection than crop products.

When one looks at the composition of farm output in the enlarged EEC, the emphasis upon the protection of grain seems remarkable indeed. As of 1970, according to some calculations based upon the Flanigan report [1], the gross value of grain was $8.5 billion. The gross value of the main livestock products was almost $39 billion. Both calculations were made in terms of prices received by farmers in the EEC as of 1969–71. If the value of grain and oilmeals fed (imported and domestically produced) is deducted the remaining value of livestock output is about $30 billion or almost four times the output of grain.

If it is assumed that labor used per dollar of output is the same for grains and livestock products (net of concentrated feed costs), and the production changes projected for 1980 in the Flanigan report between a continuation of current policies and free trade for the enlarged EEC are accepted, then the demand for labor would be somewhat larger with free trade than with a continuation of present policies. This theory assumes that labor use per unit of physical output would not be affected by changes in product prices and thus somewhat overestimates what labor use would be under free trade. But it also assumes that labor requirements per dollar of output is the same for grains and livestock products, and it appears that this assumption significantly underestimates the effects of the changes in composition of output on the demand for labor that would result from free trade.

There can be no doubt that Japanese agriculture would face difficult adjustment problems as a result of free trade. But even in the case of Japan, the added adjustment problems due to free trade would be marginal to the adjustment problems that must be faced in any case, even the adjustment problems that will be required if present farm and trade policies are continued. It will not be possible, even with very high prices, to maintain farms of the present size as viable economic units—units that would provide approximately the same return per hour of human effort as will be provided by nonfarm employment 10 to 15 years from now. It is my opinion that by 1980 the major farm policy problem as seen in Japan will be how much it will cost to produce the desired level of farm output. The issue will not be whether farm people have a satisfactory income level. The conflict between continuation of present policies and free trade will not be the result of concern over the incomes of those who remain in agriculture but rather the concern as to the ability of Japan under free trade to produce enough of its own food consumption to provide adequate national security.

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[3] I have made rough estimates of the possible effects of free trade upon the demand for land and labor resources in North America [5] and somewhat more detailed estimates for the United States [4]. The results indicate that even though a labor intensive product is highly protected in North America—dairy—the effect of free trade would be to increase the demand for both labor and land.

According to the recent projections of the Japanese Ministry of Agriculture, farm employment is expected to decline by almost 50 percent by 1982—a decline of about half in 12 years rather than the 15 years indicated in the FAO projections. But even the decline projected by the Japanese Ministry is likely to be an underestimate if real wages generally increase by 6 percent annually and real farm product prices remain constant. Higher real output prices would be required, I believe, if Japan were to maintain approximately its current level of import-dependency in food production.

My speculative comments concerning the adjustment problems in Western Europe and Japan due to free trade have put major emphasis upon the employment of labor. I should not leave the impression that all other adjustments would be of a similar marginal nature. Because most, if not all, of the net income benefits from protection have been absorbed through higher returns to land, free trade would have a major impact upon land prices. Even with a gradual transition to free trade there would probably be declines in the absolute prices of farm land, especially highly productive land now devoted to grain production. Even though there has never been, to my knowledge, an adequate reason given for governments seeking higher farm land prices, a significant decline in land prices might well have effects that many would consider to be undesirable. However, the decline in land values would in all cases be small compared to the savings that consumers and taxpayers would realize as a result of free trade. Consequently all existing land owners could be fully compensated for losses in land values, leaving a substantial net gain for consumers and taxpayers.

The Important and the Unimportant

As measured by effects upon the welfare of farm people, the agricultural policies of the industrial countries have generally concerned themselves with matters that have been relatively unimportant in determining the economic welfare of farm people. These policies have emphasized price supports, trade barriers, export subsidies, and supply management. These measures have only a marginal impact on the level of living enjoyed by farm people in industrial countries.

The primary determinants of how well off farm people are have been the level of national income per capita, the rate of national economic growth, and the way that growth has been managed. Of nearly equal importance is the extent to which farm people are integrated into the economy and society in terms of access to educational opportunity and the ease, speed, and cost of communication and transportation. The high levels of income of farm families in North America are not the result of the governmental agricultural policy measures, but are due to high levels of productivity in the economies generally.

Governments have generally done little, as a matter of conscious policy, to aid agriculture in the difficult adjustments that it must make. In fact, much of governmental policy has been motivated by a futile desire to prevent adjustment.

Almost all of what governments in the industrial countries have done to improve the welfare of farm people has been outside the framework of national agricultural policy. I refer to the support of education, the road and highway system, the encouragement of the extension of railroads, the support of agricultural research, the postal service, the provision of adult education, and the management of the economy to achieve economic growth with minimum periods of less than full employment. Had some of the resources devoted to price supports or supply management over the past three decades been positively directed toward measures to increase human capital possessed by farm people, both those who have remained in agriculture and those who found it necessary to leave, the average level of farm income would now be measurably higher than it is.

As economists we should not be guilty of the same error as has been so evident in farm policy. Free trade is not a panacea for farm income problems. The economic analysis underlying this paper says that the effect of free trade on the real income levels of farm people over the long run would be so small that it probably could not be measured.[4] The real income per farm family would be higher, but only because of the small increase in real per capita income that would result from more efficient use of all resources in an economy.

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[4] Land rent will change as a result of free trade, increasing in some countries and declining in others. It is not clear that rent would increase in all the countries that would export substantially more as a result of free trade since such a large fraction of the income benefits of existing elements of protection have resulted in increased rents. It cannot be ruled out that in some countries the decline in rent would be large enough to have some measurable effect upon farm family incomes, but I think that this would be the exception rather than the rule.

As I see it, the major advantage of free trade as a national policy is that it would clear the way for inducing policy makers and the rest of us to consider the important issues that affect the welfare of farm people.[5] And the avoidance of the enormous income transfers inherent in the existing policies would make available the fiscal resources required to permit farm people to share fully in the growth of the economy of which they are a part.

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[5] Free trade does not rule out many programs and policies designed to improve the welfare of farm people. As I have argued at length elsewhere [6, pp. 205–225], there are many measures that could benefit farm people and yet be consistent with the basic principles of free trade. These measures can be, on balance, "production and consumption neutral" and thus have little or no effect upon the value and volume of international trade. Obviously many measures will have some small effect upon production; this would be true of, say, improving education available to farm people, but some of the effects would be to increase production (greater capacity of the farm labor force) while others would be to reduce production (increased labor mobility). With some imagination, the worst effects of price instability can be minimized.

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INVITED ADDRESS

Efficiency and Equity in Natural Resource and Environmental Policy*

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PUBLIC POLICY toward natural and environmental resources has many objectives and wide impact. Taken as a whole, this policy can be neither simply characterized nor appraised. Yet there is fundamental rationale for policy in this area and, in turn, some generalizations can be made regarding the effectiveness of collective action. This discussion represents an effort to discern the order within the full sweep of policy measures in the natural resources and environmental areas and to characterize, from an economic point of view, the impact of these policies.

In the first section of the paper, it will be argued that the economic characteristics of natural resource stocks provide the basic rationale for collective action to forestall exploitation of them or to secure economic gains which would otherwise be unrealized. The nature of market failure in the use of natural resources will be briefly sketched.

The second section will characterize the policy response to these market failures and appraise the efficiency and equity effects of these policies. It will be argued that the measures adopted have not sought to correct the fundamental market failures, but have instead sought to modify symptoms of inefficiency. Rule making and enforcement has been the dominant policy strategy, while strategies emphasizing an economic approach to correcting market failures have rarely been employed. As a result, major efficiency and equity gains well within the grasp of policy have been foregone. Incomes and wealth have been redistributed and the national distribution of both has been made more unequal by the policies chosen. Perverse incentives for private behavior have been incorporated into policy measures which lead to resource misallocation and waste. The formation of vested interests has been stimulated by policy actions and, through policy, these interests have been provided both the resources and encouragement necessary to dominate policy decisions effectively.[1]

In the final section of the paper, two proposals will be offered with the intent of reducing the adverse effects of existing policy. These suggestions require reform in federal government policies and redirection in the activities of economists.

The Economic Bases of Natural Resources Environmental Policy

Use of natural and environmental resources is dominated by market failures. The nature of resource stocks and the service flows from them —as well as the structure of ownership rights in resource stocks—creates enormous potential for resource misallocation if production, distribution, and investment decisions are left to the private sector. Among the various forms of market failure affecting natural and environmental resources, the problems associated with "the commons" are dominant. For example, known pools of oil, access to which is open, tend to generate one of two forms of economic organization and behavior, both of which are inefficient and wasteful. With open access, the rate of exploitation from any well tends to be in excess of the "maximum efficient rate" (MER). Moreover, investment and extraction costs are excessive, and the total crude recovered in any period of time is supraoptimal. The economic surplus available from the resource stock tends to be driven to zero. In effect, the real cost of excess inputs induced into recovery from the common pool by implicit negative user costs absorbs the potential economic surplus on the supply side. Alternatively, if access to the pool is limited to

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* Helpful comments from D. Lee Bawden, Daniel Bromley, John Krutilla, and Eugene Smolensky are gratefully acknowledged.

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[1] It should be emphasized that none of these assertions can be demonstrated to the satisfaction of those with high scientific standards. Indeed, because the opportunity to observe the state of the world without policy is unavailable, accurate evaluation of the extent of these effects is impossible. Yet judgments must be made and the level of information is not zero.

one or a few producers, the danger of cartelization or monopoly is present.[2]

An analogous situation exists in the case of fisheries, publicly owned forests and grazing lands, and the radio spectrum.[3] Again, without public policy, open access to the resource would result in economic waste, overproduction, and the dissipation of available economic surplus. Because of the existence of a "critical zone" in the fisheries case, common use of the open access facility may lead to long run and irreversible depletion of the breeding stock.[4]

A second market failure concerns the public good nature of the services yielded by certain natural resources stocks. For example, by altering the flow of a watercourse by construction of a dam, flood control services accrue to downstream residents. These services, once produced, are available free of charge to any and all in the flood plain since none can be excluded except at great expense. Without collective action, these public good type services will not be produced, irrespective of the relationship of the social costs and gains of making them available.[5] Other examples of natural resource services not subject to the exclusion principle abound:[6] the use of waterways for navigation, the use of stream flows for waste absorption, recreation and industrial and municipal water supplies, the use of fish and wildlife stocks for recreational purposes, and, to a more limited extent, the use of diverted water for irrigation services. In all of these cases, worthwhile investments to augment the services of resource stocks will not be undertaken by the private sector—hence the justification for public investment.

A third economic basis for public natural resources policy is the standard market failure related to external diseconomies in production or consumption. Clearly, this phenomenon appears in its most virulent form in the air and water pollution problem. It is also present in the problem of congestion in the use of publicly provided recreation areas and waterway facilities. Because of the competitive nature of the services of environmental resources, unrestricted use of the waste absorption services of the air mantle and public watercourses generates reductions in the life support, recreation, and amenity services also yielded by the environment.[7] Because the users of the waste absorption services of the environment do not bear the costs of their actions, the level of such services is excessive. As a consequence, the value of the total output of environmental services is reduced below its optimum level and economic waste results.[8] Although the specifics of the pattern of resource use are different in the case of congestion, a similar reduction in the value of resource service flows is generated by the unrestricted private use of fixed-capacity public facilities.[9]

In addition to these market failure bases for natural resources policy, a basis involving institutional property right assignment considerations should be noted. Because of the post-Revolutionary War practices whereby individual states ceded claimed land areas west of their boundaries to the federal government, responsibility for both land management and disposal has fallen to the central government. During the first 100 years of nationhood, federal policy aimed at disposing of these lands so as to encourage settlement and development of the West.[10] However, largely because of the low productivity of much of this land (even if available free of charge), no claimants were found and title remained in federal hands.[11] At present, the federal government holds title to over 700 million acres of land and bears responsibility for developing and managing the use of grazing, mineral, and timber activities on these lands.

It is those market failures—common property, the public good nature of certain resource flows, external diseconomies, and imposed public ownership—which provide the primary rationale for natural and environmental policies.

An Evaluation of Natural Resources and Environmental Policies

In response to such pervasive market failure, public policy can be viewed as developing along three independent yet overlapping lines. First, in confronting common property or externality problems or in managing the use of publicly held land, policy makers have uniformly adopted a rule-making/enforcement policy strategy. Second, where the potential has existed for expanding service flows through augmentation of resource stocks, public investment programs have grown up and flourished. Finally, as conflicting uses of environmental resources and unique sites have arisen, all branches of government have been required to evolve policy on preservation-developmental alternatives. Each of these policy approaches will be discussed in turn.

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[2] See [11, 26, 38, 42, and 51].

[3] See [19, 20, 37, 50, and 55].

[4] In the case of the radio spectrum, this critical zone does not exist. For this reason, the radio spectrum case has much in common with the standard externalities model.

[5] See [33].

[6] At least this is true under current property right institutions.

[7] See [29] for a discussion of the materials balance model which establishes the basis for this competitive relationship.

[8] Indeed, if the private use of the services of environmental resources is not restricted, there is no reason why the net value of the full range of environmental resources need be positive.

[9] See [36].

[10] Since 1800 the Federal government has given away or sold over one billion acres of land. See [55].

[11] See [8 and 55].

Rule-making and enforcement policy

Consider first public policies toward resources with common property or externality characteristics—oil production, fisheries, the radio spectrum, public land, and the environment. In all of these cases, correctives to the free market are required for the attainment of efficiency. In each instance, economic strategies designed to achieve the optimal output level and to equate marginal private and social costs have been analyzed and proposed.[12] Yet, almost without exception, such efficiency-oriented policy strategies have not been adopted. Instead, public regulatory bodies have been established and elaborate rules have been designed to control the behavior of users of the resource. Rule setting, behavior monitoring, and rule enforcement is the standard pattern.

For example, in the case of petroleum recovery, an economic policy strategy of compulsory field unitization—to eliminate the negative user cost associated with the common property resource—and assurance of a free competitive market for crude oil has been long advocated by numerous economic analysts.[13] It has found little policy support. In its place state-controlled regulatory agencies have been established to set rules regarding which wells can be operated and the amount to be recovered per unit of time. Federal legislation exists to insure production consistent with state restrictions. The strategy is one of direct output control geared to the maintenance of a target price. Because of the rules, inefficient guidelines for the economic conservation of oil are provided. The most efficient wells are not used most intensively, while the least efficient wells are often used to capacity. Sustained by the Federal depletion allowance and (until recently) import quotas, the rules have generated increases in the price of crude oil which—even if not passed on as higher product prices—lead to increased profits for the large integrated producers.[14] As a system, the rules, subsidies, and restrictions have generated huge windfall gains in the form of Ricardian rents to landowners holding exploratory leases. As Stocking and Watkins [51] have stated regarding oil policy, "Monopoly has thrived . . . under the guise of conservation."

Public policies toward common fisheries, the radio spectrum, and the management of public land are analogous to the case of oil production. In each case, a valuable resource stock exists with no privately held title. In each case, rule making behavior monitoring, and rule enforcement characterize the policy strategy. In the case of fisheries, control measures adopted have typically sought to limit the total fish catch. Rules have been established to limit the length of the fishing season, the size of nets and vessels, and the absolute size of the catch.[15] As a result, a race for more sophisticated boats and gear has been stimulated among individual fishermen. While the total fishery catch was controlled, average costs of fishing effort have drifted upward eliminating the economic surplus available from the resource. As Gordon has stated, ". . . [S]ole attention [was] paid to the production side of the problem and none to the cost side"[20]. Again, an economically efficient strategy likely involving a limitation on fishing effort in regional fisheries together with maintenance of a competitive market in the sale of fish, has not been adopted.[16]

Public policy toward the radio spectrum has also emphasized rule-making and administrative allocation. The competitive, open access pattern of use of the spectrum has been altered by administratively distinguishing noninterfering segments of the spectrum and by allocating outlets within its bands for a fixed period to applicants who meet certain standards regarding the public interest use of the resource.[17] The effects of this rule-making/administrative allocation policy have been succinctly described by FCC Commissioner Johnson as follows:

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[12] Typically these strategies employ market simulating policy instruments—prices and charges—as a means of correcting the market failure or seek for a clear assignment of property rights where that is the cause of inefficiency.

[13] See [11, 38, 42, and 51].

[14] Moreover, as crude prices rise and to some extent increase product prices, the pressure on the regulatory agency to restrict supply still further is increased.

[15] See [9, 20, and 48].

[16] It should be noted that in this case, inefficient management has not led to sizable windfall gains to the owners of fixed assets. This is due to the fact that the form of control chosen has effectively eliminated the rule of capture; potential economic surplus has been eroded by increased costs.

> The demand for radio frequencies far exceeds the supply, and the system has never really been very effectively managed. We have simply made frequencies available to those who asked, when they asked, and some get unduly congested and others get really underutilized. . . . The commission serves as a replacement for the free market in allocating this resource. . . . One would think that economic analysis would be a major tool in the commission's undertaking of this task. But so far as I know there is not one economist on the commission staff who is at all concerned with the spectrum allocation and management function. The commission has made almost no use of market-simulating techniques, such as user fees, in its allocation process. [27]

The policy problems confronted with respect to the control of use of public lands for grazing, mineral extraction, and timber harvesting are similar to the common property resource cases. To control the use of public grazing areas, Federal policy has issued grazing permits for public lands in which the numbers of animals using the lands per month were specified. These permits are issued to individual private ranches of sufficient size to support the livestock when it is not on public land. Under current policy, permits are not easily transferable; private ranches possessing permits have what amounts to quasi-permanent tenure on the public land.[18] Moreover, these ranches are given preferential treatment in the allocation of new forage production and in the renewal of existing permits. As a result, the stock of actual and potential public forage land is divided up among a limited number of established landowners, irrespective of the productivity of the use to which they put it. Economic activities which do not hold leases are effectively excluded from the public range, even though the use to which they would put the resources is more productive. Finally, the fees for grazing imposed on existing permit holders are between 20 and 30 percent of the value of the forage to the permittee.[19] Thus, while use of the land is restricted and the problem of the commons avoided, a valuable asset is, in effect, divided up among a select group of property owners and given away. The implicit subsidy becomes capitalized in property values and public wealth becomes transformed into private wealth. Although the details differ, similar inefficiencies and transfers of public wealth to private individuals occur in the regulatory permit process adopted in assigning patents to mineral-bearing public lands and assigning permits for harvesting lumber.[20]

Finally, consider the policy strategy adopted to manage the use of the environment. Again, federal legislation has adopted a regulation-subsidy strategy. Beginning with the 1956 Water Pollution Control Act, federal grants totaling over $3 billion have been awarded for construction of municipal waste treatment plants, with an additional $18 billion scheduled for the next few years. While this subsidy has encouraged the secondary treatment of wastes finding their way into municipal sewer systems, it does not provide grants for the treatment of industrial wastes, the bulk of which are discharged directly into watercourses. To subsidize treatment by industrial dischargers, an accellerated depreciation provision for waste treatment investments has been incorporated into the federal tax code. Complementing this subsidy policy is a regulatory-enforcement strategy. The federal government has assigned to the states the responsibility for setting water and air quality standards and for developing a program for attaining them. In the water quality area, most states have met this responsibility by determining the maximum quantity of discharges consistent with standards, issuing licenses to dischargers consistent with this maximum, and initiating judicial proceedings when dischargers exceed permitted amounts.

The record of policy effectiveness in this area is a dim one. The subsidizing of only conventional "end of pipe" treatment leads to a concentration of resources on this approach when a wide range of other, less costly, waste reduction techniques are available. The drive for uniform secondary treatment fails to recognize differential watercourse capacities, different discharge levels in a region, and different levels of potential recreational use in a region and again leads to excessive control costs. The subsidy funds have been dissipated by failing to concentrate them on municipalities with the most harmful waste loads and by restricting their use to only the construction of waste treatment facilities and not their operation. By subsidizing the capital costs of treatment facilities, sewer charges on industrial, commercial, and domestic dischargers are decreased, providing a windfall to polluters and decreasing their incentive to reduce discharge flows.

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[17] See [37].

[18] See [8 and 55].

[19] In recent years, this grazing fee policy has been somewhat modified and the subsidy reduced.

[20] See [55].

It is also generally agreed that the rule enforcement aspect of the strategy has not been effective. Political bargaining is the very nature of the rule-making/enforcement approach and in this and other cases the bargaining is between parties of unequal power. While the regulatory process is often viewed as an instrument for public control over the behavior of the regulated, the opposite result has often occurred. At every stage in the bargaining process, those being regulated have much at stake while the public interest is diffuse, poorly organized, and poorly represented. Predictably, the bargains struck favor the regulated. In the case of water and air pollution, the enforcement process has been long and drawn out, costly in terms of legal and administrative resources, and the settlements, when reached, are either inconclusive or biased toward the polluter. Industrial polluters confront higher marginal returns from employing legal counsel to oppose and negotiate enforcement efforts than in undertaking pollution control efforts.[21]

In this area, as well, policy measures without these adverse efficiency and equity consequences have been studied and proposed. In particular, the case for the application of an effluent charge water pollution control policy seems especially strong. Incentives for waste reduction would be provided, the windfall gains implicit in the current policy would be avoided, and the allocative inefficiencies generated by regulatory unifomity would be corrected. Perhaps most importantly, the system of bargaining between regulator and regulatee would be replaced by a system which rewards reductions in residuals discharges.[22]

From this brief sketch of federal policy to correct common property or externality problems, several characteristics of the strategies adopted can be distinguished. First, in all cases the primary policy instrument consists of sets of rules governing the use of the resource by private extractors or users. Permit allocation is a standard practice and in almost all cases permits are allocated on criteria other than efficiency in resource allocation. The policy approach of the lawyer has prevailed over that of the economist. Second, those with access to use of the resource are not charged a price for the resource which represents its full economic value. As a result, public policy is responsible for distributing large windfall gains to resource users who comply with the regulations. Finally, because of the failure of federal policy to rely on economic values in controlling resource use, users are faced with incentives which encourage uneconomic or environmentally degrading practices. Moreover, incentive is provided to secure the benefits of the regulatory system through litigation and lobbying rather than through the allocation of productive resources to socially beneficial ends.

Public investment policies

The second emphasis of public policy toward environmental and natural resources is a developmental, or resource stock augmenting, emphasis. Restricting our focus to the water resources area in which the bulk of these activities are concentrated, a reasonable characterization of this policy emphasis and its effects would run as follows. Diverting real resources from the private sector through the taxation public investment process, the federal government has constructed major public works which yield over time a stream of services to beneficiaries. These benefits—in the form of flood damage averted, reduced transportation costs, reduced municipal and industrial water supply costs, and increased supplies of irrigation water—have been distributed among beneficiaries at a zero or highly subsidized price. Because of several aspects of this policy, resources have been misallocated, serious inequities have been created, and incentives for inefficient private behavior have been established.

The resource misallocation attributable to these investments has, by now, been well documented.[23] Project evaluations have overstated some categories of benefits and generally understated costs. Environmental damages caused by these projects have not been evaluated, while secondary benefits, which are in effect income transfers, have been counted as real social gains. The discount rate used to establish present values of future impacts has been scarcely one-half of that necessary to keep highly valued private resources from being diverted to lower valued public uses.[24]

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[21] For further discussion of the effectiveness of federal environment policy, see [4, 13, 14, 15, and 30].

[22] See [3, 10, 14, 28, and 45].

[23] See [17, 22, 24, and 41].

The inequities generated, while less understood, are fully as serious. Because most of the benefits from these projects are tied to the ownership of fixed assets, primarily land, their value becomes incorporated into property and land values and is reflected in the wealth account of the owners of these assets. Because the owners of irrigated and flood protected lands, barge lines, and enterprises benefiting from subsidized transportation costs are not typically poor or even middle income people, the effect of these subsidies is to increase the already serious inequality in the national distribution of wealth holdings. As Mason Gaffney [18] has stated, the benefits from water resource investment policy accrue to the "very, very, very rich" in our society.[25]

The incentives for inefficient private behavior are perhaps the most serious characteristics of federal resource development policy. As is well recognized, flood plain protection through the erection of structures has not been accompanied by a reduction in flood damages. Indeed, even though over $7 billion has been spent on flood protection projects since 1936, estimates of national flood damages have increased steadily.[26] The current strategy is to confront potential flood damages with the construction of flood protection works which display a favorable damage averted/cost ratio, financed by the general fund of the Treasury.[27] With the flood plain protected, private development which previously appeared inefficient becomes profitable. With the higher level of development, even the reduced stream flows cause damages in excess of what they would have been *without* flood protection.[28] In effect, because the services of the improved flood plain are made freely available to any development activity, an elaborate series of inefficient activities are stimulated: uneconomic invasion of the flood plain occurs; land values in the plain rise rapidly; alternative measures of damage aversion are not undertaken even though more effective; political pressure for more subsidized control projects is generated; and in the long run, no real flood damages are averted.

The dimensions of this perverse incentives problem have been recognized for nearly a decade now, and a program of mandatory flood insurance with appropriate incentives for efficient behavior has been studied and proposed.[29] Nevertheless, little corrective action has been undertaken. Although flood insurance has been offered to residents in flood plains at a subsidized rate through the 1968 National Flood Insurance Act, few takers have been found. To residents in flood plains, additional protection works financed by taxpayers appear more profitable than the flood insurance subsidy!

While examples of other natural resources policies with perverse incentives are numerous,[30] there is one overriding incentive implicit in existing public investment policy. This is a serious and perverse incentive for political activity leading to project misdesign and program overexpansion. In a dynamic political context, the availability of subsidized benefits stimulates the formation of vested interest groups designed to exert political pressure for the expansion of these often inefficient programs and for the maintenance of uneconomic project evaluation criteria.[31] In essence, the existence of these subsidies sustains the efforts of such groups to bring economic power to bear in nurturing the programs which confer protected economic positions on them. This economic power is parlayed into political influence.[32]

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[24] See [2, 23, 53].

[25] See also [47]. One study of federal irrigation projects approved in the mid-1960's estimated that the value of the water subsidy averaged $122,000 per farm served. See [46].

[26] See [21 and 52].

[27] States, localities, and individual beneficiaries pay, on average, only about 25 percent of total costs.

[28] It has been estimated that for every dollar of *potential* damages averted, nearly one dollar of *actual* additional damages is created by the developments induced into the flood plain.

[29] See [32 and 52].

[30] These include the incentive for the mislocation of plant and equipment investment due to the subsidy awarded by public navigation investments; the incentive for premature and excessive development of resources by the ability to treat early losses from development as expenses in the income tax law while longer term gains are treated as resource appreciation and lightly taxed; the incentive for vertical integration and market concentration in the petroleum industry due to the depletion allowance; the incentive for increased agricultural output working at odds with general agricultural policy, attributable to the provision of irrigation water below costs; and the incentive for the congestion of outdoor recreation facilities because of the zero marginal cost associated with entry decisions.

[31] The political impact is in addition to the incentives for inefficient factor combinations by the users of zero priced inputs; the incentives for the development of "excess demand"; and the incentive for premature congestion, leading to facility construction of greater capacity or earlier facility expansion than economically justified. For a discussion of these dynamic incentive problems, see [34].

To be sure, citizens in their capacity as taxpayers and consumers have a stake in these decisions. It is in their interest that governmental taxing, spending, and regulatory decisions meet an efficiency norm and some established and accepted standard of distributive justice. It is in their interest that public decisions be open and explicit with the efficiency and equity results visible for all to see clearly. However, in today's system of political economy, citizens *qua* citizens confront major obstacles in exercising their vested interest in efficiency, equity, and openness. They are unorganized, uninformed on the technical details of public issues, and without a designated spokesman. Moreover, because each of them bears only a small cost of any policy, there is little incentive for any one of them to spend the time, energy, and resources required to organize opposition to a complex policy—irrespective how inefficient or inequitable it may be.[33] As a result, taxpayer interests tend to be submerged and often ignored. Powerful and organized vested groups, subsidized by government programs, are able to bend government decisions to serve their interests. The public works decision process is a prime illustration of this situation.

Preservation-development policies

A third line of policy development relates to the mutually exclusive use of natural and environmental resources. In recent years, resolution of increasing numbers of these issues has been required of all branches of government. The Hell's Canyon and Trans-Alaskan pipeline cases are but prominent instances of such issues which are typically marked by confrontation between development and preservation interests. In this rapidly evolving area, the guidelines for effective policy are not clearly perceived. As a result, the political economy problem is seen most clearly. As analyses of a few of these cases have indicated, the benefits yielded by the development alternative tend to be visible and targeted on a small and readily identifiable group of beneficiaries.[34] On the other hand, a large proportion of the benefits from preservation will not develop for several years[35] and then will accrue to users who are largely unidentified and perhaps not yet born. Moreover, some of the benefits stem from the value which citizens generally may place on the option to visit the preserved site at some future date.[36]

This disparity in the size and composition of the two beneficiary groups explains much of the existing developmental bias in the process by which public decisions on preservation-development issues are made. It also explains the developmental bias implicit in the criteria for water and land resources evaluation—namely, the low interest rate used, the overestimation of project benefits, and underestimation of project costs.[37] Moreover, it has serious portents for the evolution of standards for the environmental impact statements to be prepared under the National Environmental Policy Act (NEPA). With the beneficiaries of government projects organized and concentrated and the bearers of the environmental costs of such projects as disparate and numerous as taxpayers, pressures for erosion of standards will inevitably develop and, in the absence of special vigilence, erosion will occur.

Toward Reform of Natural Resources and Environmental Policy

If these observations about federal resources policy are correct, changes yielding substantial social efficiency and equity are in order. The nature of policy measures to effect these changes is implicit in the previous discussion. In conclusion, two more general suggestions for improvements in policy will be presented. The first of these represents a first and important step in retarding the dynamic political economy problem referred to above. The second is focused on the need to increase the role of objective economic analysis in national debates of policy alternatives.

Tying beneficiaries to costs—the need for a comprehensive system of beneficiary charges

Pervading the description of resource and environmental policy is the problem of the separation of the beneficiaries of resource use from those who bear the cost of such use. Because of this separation, distinguishable groups of people are subsidized at the expense of other (typically larger) groups. Moreover, the subsidized are provided both the incentive and the wherewithall to manipulate the political system to maintain the flow of subsidy—whether or not an economic or social function is served and without regard to cost. As the survey of policy revealed, these vested interest groups are readily identifiable—landowners along flood protected watercourses, the owners of industrial and commercial firms contributing to water- and air-borne wasteloads, ranchers utilizing public lands for forage, lumber interests harvesting public timber, mineral interests seeking leases on public lands, irrigators using publicly developed water supplies, the owners of barge lines using public waterways, and the owners of petroleum companies and oil-bearing lands.

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[32] See [25].

[33] See [44].

[34] See [5 and 35].

[35] For an insightful discussion of the disparity in time pattern in the streams of returns from preservation and development and of the differential effect of technological progress on value of the two streams of returns, see [31].

[36] See [7].

[37] See [6].

A major improvement in the efficiency and equity of public resources policy can be achieved by a reduction of the enormous bundle of subsidies conferred by existing policy. Elimination of the existing separation of beneficiaries and cost-bearers of policy measures through a comprehensive federal beneficiary charge policy would yield this improvement. And such a policy would also rupture the linkage which sustains the ability of vested power to dominate the public natural resources and environmental policy process.[38] The major components of such a policy would include:

- An effluent charge system on waste dischargers to public watercourses and the air mantle.
- An increase in the price of publicly produced irrigation water to its market level.
- A national system of mandatory flood control insurance with premiums set equal to expected loss.
- An increase in the federally administered price for grazing rights, timber rights, and mineral leases to the full market value of the resource services provided.
- Imposition of user charges on barge lines using federal waterways.
- Imposition of charges for the rights of use of the radio spectrum.
- Congestion-related user charges for recreation areas.

Clearly the process of legislating such changes lies within the ken of legislators and not that of economists. Yet the recommendations of economists can be instrumental in inaugurating changes in economic policy. To this end, a call by economists for a *National Commission on User Charge and Beneficiary Cost-Sharing* would appear to be in order. Such a commission should have the responsibility to develop a comprehensive system of user charges and beneficiary cost-sharing arrangements so as to eliminate the current separation of program beneficiaries from cost bearers.[39] To the extent that attainment of an economic system is impeded by non-federal legal institutions—for example, western water law—recommendations for changes in such arrangements should also be developed.[40]

Heretofore, the role of economists in stimulating policy changes in this area has not been outstanding. A fixation on marginal cost pricing and efficiency-in-the-small has impeded recognition of the larger efficiency effects generated by the dynamic political incentives of existing subsidy-oriented policy.[41] As a result, studies helpful in designing a full-cost beneficiary charge system are not plentiful. Little detailed study designed to identify the beneficiaries of resource policy has been undertaken. Little is known of the effect of these programs on the distributions of income and wealth. The full cost or market value of publicly provided services has been estimated in but a few cases. In addition, little is known regarding the relative effectiveness of, for example, a two part pricing scheme versus a marginal social cost pricing arrangement in financing and regulating the use of various resource flows.[42] Because questions such as these are fundamental to development of an effective beneficiary charge policy, the role of economic input into the work of a national commission would be crucial.

It should be noted, however, that a long standing impediment to instituting subsidy reducing beneficiary charges is the fear that an additional financial burden will be placed on low income families. This is so in spite of the evidence that the current system of natural resource and environmental subsidies is targeted on the high income population. Hence, wider use of such charges for efficiency reasons must go hand in hand with adoption of an effective income maintenance program for low income families. Without such a national program, the efficiency gains of beneficiary charges will appear to many as subsidiary to the additional money costs imposed on the low income population, even if they are small.[43]

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[38] Within the past few years, a number of prominent public or quasi-public bodies have recommended extension of user and beneficiary charge arrangements, especially in the natural resources area. See [39 and 54]. The failure of the Water Resources Council's proposed standards to address this issue effectively is noteworthy. See [6].

[39] While marginal cost pricing rules may suggest low user charges for some projects with decreasing average costs, any comprehensive user charge policy should consider perverse signals for investment and the political incentives for program expansion and poor project selection which such prices entail. These consequences often far outweigh the short run allocational advantages of such charges.

[40] See [1, 19, and 49].

[41] See [16 and 43].

[42] See [34 and 43].

Attaining efficiency in public resource investments—the need for effective application of economic criteria

The sacrifice of efficiency objectives in political choices among investment alternatives is well-known. Although economic criteria have been developed and used in academic studies, their use in guiding actual public decisions leaves much to be desired. In some areas, benefit-cost estimates tend to be biased toward development. In other areas, benefit-cost evaluations are not undertaken at all. Parochial and bureaucratic concerns of bureaus and agencies have often operated to stifle objective analyses or to bias their results subtly. Even more discouraging is the failure of inappropriate efficiency concepts —secondary and regional benefits and navigation benefits defined as savings to shippers—to be cast aside in recent efforts to reform evaluation standards.[44] On top of all of these problems is the absence of an institutional arrangement to stimulate and support objective evaluations of existing and proposed policy, to screen and publicly critique analyses forthcoming from any source for standards of objectivity and quality and to insure that economic analyses of policy alternatives are made available and utilized in policy deliberations.

While the case for this sort of capability located in the executive branch of government has been voiced,[45] it would seem that the case for Congressional establishment of such a function is even stronger. It is in the legislative branch that national debates regarding policy alternatives are focused and where many of the important preservation-development conflicts are ultimately resolved. At the present time the Congress is less able than the Executive to judge the quality and objectivity of evaluation studies; as a result, competent and incompetent analyses and those performed by vested interests and by objective analysts are given largely equal weight in the legislative decision process. Moreover, in spite of recent efforts to reorient the General Accounting Office, the Congress has little capacity to undertake studies of its own. Finally, given the existing practice of the executive branch, few if any analyses sponsored by agencies find their way to the Congress or to citizens at large.

For these reasons, it would seem highly desirable that the Congress create an *Office of Policy Evaluation and Analysis* with substantial staff capability.[46] This office would be responsible to all Congressional Committees, all Congressmen, and, through them, all citizens. It would be the responsibility of this office to perform the functions listed above and, on occasion, to undertake analysis of proposed activities and existing policies at the request of Congressional offices. To insure quality and objectivity, this office should have a policy board of analysts and scientists who meet standards set by appropriate professional organizations.[47]

Such an office would strengthen the role of objective analysis and evaluation in the formation and reform of federal natural resources and environmental policy. More importantly, it would move to redress the balance between private interests and the public interest in the design of policy. Perhaps most importantly, it would make information and knowledge available to Congressional representatives who might find it in their own interest to give explicit representation to the public interest. It is currently the lack of such information and analysis which restrains political leaders from publicly challenging the position of vested interests and which inhibits the practice of national debate by both political leaders and citizens.

This suggestion, like the previous one, has implications for the analytical community. Heretofore, efforts made by economists to increase the role of objective analysis in public decisions have not been noteworthy.[48] The number of studies which have addressed major public resource allocation questions—focusing on their efficiency and equity consequences—have not been large. Those that have been timely have often not been presented in a form interpretable to Congressional staffs or other public officials, and little effort has been made to have them entered into the public debate. Typically, they have been revealed only to professional audiences through technical journals. The voluntary participation of economists in national debates on resources policy has likewise been scanty.

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[43] See [43].

[44] See [6].

[45] See [40].

[46] Expansion and strengthening of program evaluation activities by the General Accounting Office, begun a few years ago, would be one means of proceeding.

[47] A related proposal is contained in [54]. Also, the Report of the National Water Commission contains recommendations relating to such a capability. See [39].

To be sure, the incentives for participation within the academic community are not strong. University promotion and tenure policies do not highly reward policy analysis and evaluation studies. In addition, the danger of prejudicing future research grants through the alienation of agency personnel is inhibiting. Such forces have permitted the domination of natural resources and environmental policy by vested interests and make reforms of the sort discussed above difficult. Rethinking of the structure of incentives by university administrations and departments would seem to be in order as would the committment of individual analysts to professional activities with direct relevance to national policy reforms. The *pro bono publico* tradition of the legal profession may provide an important example for the social sciences.

Obviously, neither of these reforms would, by themselves, assure equity and efficiency in natural and environmental resources policy. But they are a start. In addition to their impact on policy itself, they would be important vehicles for reorienting the work of both general and agricultural economists away from narrow scientism and efficiency-in-the-small and toward important and relevant policy questions—questions of social efficiency and equity in access to both economic resources and political power.

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[48] The recent lack of participation by economists in Water Resources Council hearings on proposed evaluation standards is but one example.

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INVITED ADDRESS

The Neglected Human Factor*

D. LEE BAWDEN

AT THE RISK of being overly dramatic, I would like to observe that we are in the middle of a twenty-year period which future historians will look back on as *a,* if not *the,* major decision period in the life of the agricultural economics profession. The past 10 years have been the Decade of Awakening. What we do during the next 10 years may very well decide whether the agricultural economics profession fulfills its historical reputation of an institution useful to society in solving its problems or the profession becomes a socially irrelevant institution unworthy of society's support. I draw this conclusion, not on the basis of what *I* observe, but on the basis of what the leaders of our profession have been telling us. The message is loud and clear, and we have heard it time and again over the past 10 years.

In the first half of this century, when the farm population was relatively large, when farms were small and principally owner operated, when the primary function of rural communities was to serve the farm industry, and when food made up a sizeable part of the consumer's budget, agricultural economists joined other scientists in solving a major problem of our society, namely how to produce, process, and market food and fiber efficiently at low cost and in sufficient quantity to feed and clothe a rapidly expanding population. But, times change, and so do the major problems of society. Farms are now larger and few in number, farmers earn more from wages than they do from farming, and rural communities are becoming increasingly linked to urban areas. In short we can no longer equate the welfare of farms with the welfare of farmers and the welfare of farmers with the welfare of the rural community [2]. Previously unrecognized or ignored problems have been "discovered" and new problems have emerged. Moreover, with food now representing a small part of the consumer's budget, the relatively affluent urban population is concerned with much more than low-cost food and clothing.

This is a part of the message we have been hearing. The other part is that *the focus and scope of agricultural economics must change if we are to contribute to the solutions of the major social issues of our time.* In his 1967 presidential address to the AAEA, Bishop observed that "To continue on the road we have been traveling will likely lead us into the role of publicly subsidized consultants to the corporate farms and marketing firms of the future" [2, p. 1007]. He urged that we devote more attention to "economic problems that are important to the majority of the rural population" [2, p. 999] and to ". . . analysis of policies and programs designed by city-minded people . . ." [2, p. 1007].

In addition, we have been encouraged to broaden our traditional activities and to confront new problems in presidential addresses by Hathaway in 1969 [10], Ruttan in 1971 [21], and Castle in 1972 [8]. Perhaps Hathaway sums it up best. He first cites the definition of social science as "concern with the welfare of human beings of society." He then wryly observes that "During the last quarter of a century we have made tremendous strides in putting the *science* in our social science. Having done this, I believe we should now put additional emphasis on the *social* in our social science" [10, p. 1017]. But we need not look only to presidential addresses to find this same general message. Shultz in 1964 [23], Bonnen in 1965 [3], Ruttan in 1966 [20], Buchanan in 1969 [6], and Glen Johnson in 1971 [13], to name only a few, have all argued that "times have changed" and the profession must change

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* One cannot easily separate those observations, thoughts, and conclusions that are original (if any) from those provided directly or indirectly by my colleagues in and out of the profession. Without implicating them, I would like to express my appreciation to those who helped me in the preparation of this paper, either in initial discussions or by reviewing an earlier draft. They are Keith Bryant, Rueben Buse, Carlene Cumpton, Peter Dorner, Varden Fuller, Bob Haveman, Peter Helmberger, Cobe Johnson, Max Jordan, Pat Madden, Willard Mueller, Brian Perkins, Glen Pulver, Ron Shaffer, Luther Tweeten, and Dick Weigle. I also want to thank Rose Bauernfeind, Barbara Canak, Dave Crawford, and Sharon Mastenbrook for technical assistance in preparing the paper.

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with it and that there are a large number of important social issues which are relevant to our profession but which are presently being ignored or given short shrift by us.

I call this past 10 years the Decade of Awakening because papers abound in the proceedings issues of the AAEA which are calling forth this message. Are we listening? Will we take heed? To date there is only scant evidence that we have heard and heeded the message. Departments do seem to be hiring more new staff members specializing in human resources or community development, for example. But this has not yet been reflected in research published by our association's journals, except for the invited papers at the annual meetings. In a review of articles in the *American Journal of Agricultural Economics* (*AJAE*) during the past 10 years (excluding proceedings of the summer and winter meetings) only 6.7 percent of the articles and notes dealt with such domestic issues as health, education, income distribution, manpower training, income maintenance, minimum wages, migration, rural services, the distribution of agricultural or social program benefits, community development, or the special problems of the aged, the poor, farm laborers, or minority groups. A review of the *Canadian Journal of Agricultural Economics* (*CJAE*) turned up a similar result—only 6.4 percent of the articles and notes focused on these "people" problems and issues.[1] Contrast these percentages with the greater emphasis given these areas by our officers in preparing the programs for annual meetings in the past few years.

A peripheral, though interesting, additional piece of evidence relating to our lack of concern with these areas is that the 1971 survey of AAEA members, subsequently published in the 1972 Handbook, allowed members to select from among 12 fields of specialization. Nowhere among them was community development, or the rural public sector, or human resources, or rural poverty.

Despite this fragmentary and mixed evidence, I, for one, am hopeful that we will hear and heed the message, that we will make the commitment to a sharp change in the scope and focus of our activities in the decade ahead. I would like, therefore, to proceed under this assumption and address two questions which arise from this commitment. What are the present and foreseeable problems which we are neglecting now and on which we have a comparative advantage in working? What actions can be taken by the associations and by individual departments to encourage and facilitate a changing scope and focus?

The first question has been addressed in the papers I cited previously plus several others. I merely want to add my particular observations and interpretations. It is my general observation that we have neglected the human factor in much of our work. Too frequently we have lost sight of the fact that our clientele is *people*, not farms or processing plants or geographic areas or natural resources *per se*. Too frequently we have not given enough attention to *who* benefits from our work. Secondly, if we are to rectify our neglect of the human factor, we will have to shift some of our energy and resources into nontraditional areas of inquiry. And with the dim prospects for growth in the next few years, either in terms of personnel or research funds, this implies that we will have to reduce work in traditional areas *substantially* if we are to give increasing attention to these new areas.

A final general observation is that we will have the most success in dealing with new problems and policy issues which draw upon our existing knowledge and experience. We should give most of our attention to policy issues involving the rural sector of our society.

In commenting below on the specific issues and problems to which we should give increased attention, I will not attempt to be comprehensive. Rather I will make three points: the first deals with a group of people, the second with an issue, and the third with some views on two relatively new areas of interest to our profession.

The Neglected Majority

In *Hard Tomatoes, Hard Times,* Jim Hightower makes a serious indictment of agricultural research and extension activities in the Land Grant Colleges. He states that "rural people including the vast majority of farmers, farm workers, small town businessmen and residents, and the rural poor, either are ignored or directly abused by the land grant effort" [12, p. 10]. The same observations could be made regarding the efforts of agricultural economists. Obviously one promising avenue for redirecting our efforts, then, is toward the problems of this neglected majority. And we should include the special problems facing rural Blacks,

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[1] Within this ten-year period there has not been a notable increase, either. The percentages for the past five years are 7.2 percent and 5.2 percent for the *AJAE* and the *CJAE* respectively.

Mexican Americans, and American Indians as well. It is worth noting

- that the farm population in 1970 represents less than 20 percent of the rural population;[2]
- that in 1970, 51 percent of farm household income was from wages and salaries, only 39 percent was from farming, and 10 percent was from other sources;
- that for every 100 farm operators in 1969, there were 94 wage workers [17]; and
- that minorities make up almost 10 percent of the farm population but own a mere 3.6 percent of the farms, and 84 percent of those are at the subsistence level.[3]

I would join others in urging that we direct a portion of our energy and resources to the problems of *all* rural residents at the expense of the attention we now devote to the commercial farmer.

Inequality

The great social issue of the 1960's was inequality, and while it has been put on the back burner by the present administration, it will become a central issue again simply because the problems are still there. We still have an economic and social system which gives 43 percent of the income to the richest 20 percent and only 4 percent to the least fortunate 20 percent [7], and which allows a fifth of the population to own 97 percent of the stocks and hold 77 percent of the wealth in this country [19]. Moreover, the income distribution is even worse among the farm population, the gini coefficient being .42 compared to .36 for the entire United States. Minority groups also fare worse in rural areas. In the total U. S., the median income of Black males was 65 percent of that of white males in 1969, but it was only 46 percent among the rural nonfarm population and a mere 39 percent among the farm population.

Ten years ago Kenneth Boulding wrote a paper in which he gave grades to various members of the agricultural community on three criteria: allocation, growth, and social justice [5]. He gave universities and extension services an A+ for promoting growth, an A for allocation,[4] and a C for concern with social justice. On social justice, he said "the universities and extension services are still very fundamentally middle class. I am terribly worried about [their] separating out of our economy the 75 percent who make it to affluence [from] the 25 percent who don't. The universities are not doing anything for the 25 percent. . . ." [5, p. 165–166].

The situation has not changed much in the past 10 years. I do not know which is more distressing: that we have ignored the poor or that we have failed to recognize the excesses of the rich. Our problem has been that we have often focused on *average* income. If the average rose, that was good; if it fell, that was bad. We ignored the fact that *average* income can rise due solely to increasing incomes of the well-to-do.

Our neglect of the inequality issue has been pervasive. We have been criticized for ignoring distributional issues in economic development [9], in natural resource policy [14], in commercial farm policy [4, 16], in technological innovation [11, 22], and in virtually every other major research area. We have taken some corrective action recently, most notably in the natural resource area, but we still give slight attention to *who* benefits from our research and the consequent changes in technology and policy. I would hope that this issue—the issue of inequality, or the distribution of costs and benefits—will be given high priority in our more traditional research and extension efforts during the next decade.

Our neglect of the inequality issue has had a most serious effect in another direction as well. It has resulted in an almost total disregard by agricultural economists of some of the major social programs currently under consideration by Congress, programs which, if enacted, will have a major impact on the welfare of rural people. To cite a few examples,

- we have done little research on the consequences of extending welfare to the working poor, despite the fact that 19 percent of the total recipients would be farmers or farm laborers and 45 percent would reside outside of SMSA's;[5]
- we have done little research on the universal

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[2] Where sources are not shown for data cited in this paper, the source is either the 1970 Census of Population or the 1969 or 1964 Censuses of Agriculture.

[3] Subsistence is defined as gross sales of less than $10,000, which on average is equivalent to a net income of approximately $2,500 [18].

[4] He said the grade for allocation was a C 25 years ago, rising to an A in recent times [5, p. 165].

[5] These figures are for the program proposed in H. R. 1, President Nixon's revised Family Assistance Plan [26, pp. 230 and 232].

income-conditioned Housing Allowance Program currently under consideration, despite the fact that "nonmetropolitan counties account for 66 percent of all substandard housing units and receive only 16 percent of all Federal housing assistance" from the present programs [25, p. v];

- we have done little research on the consequences of the income-conditioned Health Insurance Program currently being tested, despite the fact that a substantially smaller percentage of rural than urban families are covered by health insurance;[6] and
- we have done a relatively small amount of research on alternative methods of financing public education, despite the fact that both the quantity and quality of education in rural areas is generally inferior to urban areas, and despite the fact that the present method of financing education ignores the spillover effects of outmigration, resulting in the benefits of education financed by rural taxpayers being reaped by the urban population.

Many more examples could be cited, such as manpower training programs, reform of the personal income tax, labor legislation, etc. It is obvious that by not participating in the formulation and evaluation of these human resource policies and programs, we have neglected issues of vital importance to rural people and to society in general. It is not a coincidence that rural people have been slighted in public programs of education, health, manpower training, welfare, and housing. For this we must accept a share of the blame. One new direction of high priority, then, is for agricultural economists to become more heavily involved in research on the formulation and evaluation of national policies and programs in addition to those involving agricultural commodities and natural resources.

Two Emerging Areas

My third and final comment on the question of new directions we might take involves two relatively new issues: community development and the environment. We are witnessing the birth of two new areas of specialization within the profession. Our response to these newly expressed needs of society is commendable. But, I would hope we have learned enough from our past experiences such that we will not make community growth and environmental quality ends in themselves, and that we will not neglect the distributional issues relevant to them.

Consider community development first. I find in some community development specialists a dedication to the preservation of rural communities equal in fervor to our past dedication to the family farm. Once again rural fundamentalism raises its ugly head!

The rural area is not superior to the urban area as a place to live, and it probably never will be. The belief that it is superior, or can be made to be, is one of the underlying reasons why we have felt justified in paying so much attention to the problems of areas, regions, communities, and farms, and so little attention to the welfare of rural people.

Community development is often measured by increases in population or by increases in local industrial employment. And if the standard is income, then it is invariably an increase in *average* per capita income that is the success barometer. By these measures, those who benefit the most are often the owners of resources—farms and the manufacturing, retailing, and service industries. It is not a coincidence that these very people are the political power structure of the community. Of course, we used to believe that the "trickle-down" effect was strong, that the poor benefited from general economic growth as much as anyone else. Recent evidence is casting doubt on this hypothesis, however. The low income person of today may benefit little from helping the well-to-do resource owners in a community [1, 15, 27].

Also, many rural towns in the United States are dying, by any measure one wants to use, and most of them are not salvageable. If our concern is with people rather than areas *per se*, we should devote energy to the development of a strategy for helping communities to die gracefully as well as a strategy for helping communities to grow.[7]

My comments with respect to the quality of the environment are parallel. I find an almost

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[6] The percent of persons covered by hospital insurance in 1968, by residence, is shown below [24, p. 91]:

Age	SMSA	Non-Farm Non-SMSA	Farm
0–16	78.2%	71.0%	59.7%
17–24	77.0%	70.3%	56.3%
25 and over	86.4%	81.4%	70.8%

[7] Ron Shaffer has pointed out to me that we do have a *passive* "death" policy in that, by and large, we aid only those communities which are growing.

religious fervor among some environmental specialists for the preservation of the natural state. As with community development, I would hope that environmental quality does not become an end in itself. More serious, however, is the distributional issue. Castle has observed that low income families will probably view environmental issues very differently than high income families [8]. To be more specific, society must make choices between preserving wilderness areas and beautifying the streets and parks in cities, between providing clean lakes for the affluent to swim in and building neighborhood swimming pools, between developing isolated camping/recreation parks and building playgrounds in the ghettos. I hope we will contribute to the making of those decisions by applying economic analysis to all choices, not just those which appeal to the affluent.

The second question that faces the profession is what action can be taken by the associations and by individual departments to encourage and facilitate a changing scope and focus.

Some Suggested Actions

The profession is and has been slowly changing its scope and focus over time. The change comes primarily at the initiative of departments, through the redefining of vacant positions and the defining of new positions, and at the initiation of individuals by way of taking on new research projects or completely switching fields of specialization. But greater organization, coordination, and leadership will be required if we are to experience a sharp change in scope and focus in the next decade. That leadership should initially come from the two national associations.

Nearly three years ago my department at Wisconsin invited four eminent agricultural economists to address us separately on their perspective of what the scope and focus of an agricultural economics department *should* be. We purposely picked men who were of diverse interests but who we knew had breadth and vision. It was a most interesting and educational series of seminars, and it had a considerable impact upon our department. A departmental committee subsequently issued a report on "Goals, Priorities, and Staffing" which differed substantially from our previous periodic in-house assessments. Three staff positions, soon to be vacant, were redefined to describe areas in which we had not previously hired.

I relate this experience, not to recommend it to each department, but to suggest a similar but more extensive exercise at the national association level. Specifically, I suggest that the AAEA and the CAES sponsor separate task forces to consider the future of agricultural economics. I say separate because it is quite probable that the priority issues of the two countries are different and will be in the years ahead. These do not have to be elaborate task forces, and they would not require a large amount of funding; moreover, outside funding might be obtainable. I have in mind a modest effort that would require a half-time director for 6 to 9 months plus perhaps the time of 20–30 people for two months. Some of these people would write papers on *their* perspectives of what the future scope and focus of our profession should be. Others might work in groups to explore, in depth, certain social issues. A week-long seminar could be held at the end to discuss papers emanating from these efforts, after which the director, perhaps assisted by an executive committee, would issue a report to the association. The report might be published as special issues of the *AJAE* and the *CJAE*, with chapters representing the more important viewpoints. The cost of such a venture would probably not exceed $150,000 for each association.

These reports would serve as stimulating and useful guides to the Economics Branch in the CDA, the Economic Research Service in the USDA, and departments of agricultural economics in the various universities and colleges. Moreover, they would provide some support to a department chairman in arguing with the Dean (or his counterpart in the federal departments of agriculture) for new and/or redefined positions outside the traditional bounds of agricultural economics.

My second suggestion is that, concurrent with the formation of the task force, the associations ask each department to provide them with descriptions of specialties of each staff member. These should not be predefined; rather, they should be open-ended descriptions provided by the member himself. It is my guess that such an exercise would define at least four times the number of specialties listed in the 1972 AAEA Handbook, and we would discover some "new" areas which would be a useful input into the deliberations of the Task Force. For example, many agricultural economists, including department chairmen, do not make a distinction between human resources, the rural public sector, and community development. At least, I often see job descriptions which encompass all three, and sometimes natural resources is thrown in to boot. But they are three distinct, though interrelated, areas of specialization. A single person cannot hope to be learned in all three.

To illustrate this point, I will present my definitions in brief of these three areas:

(1) *Human Resources*. This area focuses on the income earning abilities of individuals (or households) and how such capabilities may be increased, especially through public programs. A major concern is with low-income households. Factors affecting income-earning capabilities include mental and physical endowments, knowledge, skills, and information. Thus, this area deals with the entire range of labor supply variables, including migration. On the program side, those related to investment in human capital would be of principal concern—education, health, manpower training, management skills for the self employed, vocational rehabilitation, employment information, etc.

(2) *The Rural Public Sector*. The focus here is on the effectiveness of government and quasi-government institutions, policies, and programs in dealing with problems of rural residents. Attention is given to the availability and distribution of benefits by income class and by residence, the incidence of costs via taxation, and the efficiency of production and delivery. In terms of institutions, emphasis would be on state and local governments and on man-made institutions, such as housing and transportation authorities, community planning agencies, air pollution districts, etc. Programs of interest would include education, health, public assistance, roads, water, sewer, garbage disposal, police, fire, library, vocational and manpower training, postal service, power, communications, and flood control. The financing of these programs leads to investigations of state and local finance, especially taxation policies.

(3) *Community Development*. This area focuses on community or area *growth indicators*, defined in terms of output, population, and income. It is concerned with the distribution among sectors within the community, as well as the distribution of income and jobs among individuals. The emphasis is on identification of existing resources of a community to develop strategies for change, whether that change be growth or decline. The emphasis is on government activities, capital flows (both public and private), labor demand and supply, and public goods as they relate to firms.

According to the above definitions, these are three rather separate areas. Community Development is often used as a general term to encompass all three areas, but as a matter of fact, the skills required to do research and extension in community development as I have defined it only slightly overlap those required to study the rural public sector or human resource investment. My point is that specialty definitions from all members would reveal not only our current distribution of people among fields, but would by itself define and highlight some relevant issues and areas of which many of us may not be aware.

A third suggestion is that agricultural economics departments in universities and governments begin now to look critically at their own staffs in terms of areas of specialization. The central question to ask is whether the current balance of specialization is optimum in terms of meeting the most important current and future problems of our profession. Individual departments face different policy issues and have different political constraints on their freedom to make sharp changes in focus. Nevertheless, there will be much commonality, and the Task Force studies will be useful to departments in making their assessments.

Departmental reviews are nothing new; they are conducted all the time. But they are often so structured that vested interests prevail over proposals to make anything but minor shifts of resources within the department. Their greatest use is in defining vacant or new positions for recruiting purposes. But, if the next 10 years are to be a decade of redirection, they must do more than this. With college enrollments leveling off and with stable or declining federal support, we can expect little growth by way of newly created positions for some time to come. If we are to change rapidly, many existing staff members will have to alter the primary focus of their work. This will require explicit action by departments, perhaps by closer monitoring of sabbatical leaves (so that they are devoted to retraining), subtle encouragement, and hard budget choices.

My fourth suggestion is that we restructure our training of graduate students. This involves new courses and new majors. We might, for example, offer majors in foreign economic development, production economics, marketing of agricultural commodities, natural resources, human resources, community development, and the rural public sector. But these are only examples. Majors should and do change over time. The problem seems to be that the creation of new fields, and especially new courses to support them, lag far behind the emergence of new areas of inquiry and student interest in these areas. The time required to develop a new course is a serious deterrent to changing curricula if left to the initiative of individual professors. Perhaps departments and their chairmen will have to take a stronger hand in seeing that new courses are developed to train graduate students to analyze new problem areas effectively. The way we have historically trained our graduate students (plus our lack of involvement with national agencies other than the USDA and the Department of Interior) has resulted in a dearth of agricultural economists in research and policy analysis positions in such agencies as the Department of Labor, HEW, HUD, OEO, OMB, Justice, the Treasury, and Commerce—all of which have a great deal to do with the welfare of rural people. Hopefully a broader training of students will partially rectify this situation.

A fifth suggestion is that agricultural economists challenge agricultural experiment stations to fund more nontraditional research. We often use the experiment station as an excuse. But, I recall Ed Bishop saying one time that whenever this is presented as an excuse to him, he asks the department how many submittals they made that were turned down by the experiment station. He found very few and said he was convinced the experiment stations funded traditional research in part because that is what is asked of them by researchers. Moreover, agricultural economists have been slow to look to other sources for funding, primarily because the Agricultural Experiment Stations have been so generous. In the past few years agencies such as Labor, HEW, OEO, and HUD have begun to recognize their past neglect of the rural sector and are now setting aside more funds for "rural" research. We have not yet begun to capitalize on these opportunities.

My sixth suggestion deals with the lack of minorities in the agricultural economics profession. 9.6 percent of the farm population is Black, Mexican-American, or American Indian. For the rural nonfarm population, this figure is 9.0 percent. But among agricultural economists, members of minority groups probably make up less than one percent of the total membership. This underrepresentation of minorities is undesirable on the grounds of social justice, but there is a far more important reason why we need more members of minority groups: to help us in recognizing and solving the special problems of minorities in rural areas.

One reason agricultural economists have been so successful in dealing with the problems of the farm community is that most of us were reared on a farm; we knew a great deal about the problems of farmers before we ever started graduate school. The same reasoning applies with respect to minorities. Solutions to discrimination in rural labor markets, for example, are more likely to be discovered by someone who has experienced this discrimination and knows the various and subtle forms it takes. We argue with some justification that we cannot hire minority professors because there are no minority graduate students in agricultural economics.[8] But this only begs the question of why there are none in our graduate programs. One answer is that, while we do try to give equal opportunity to all races and cultures, we do not have an effective affirmative action program. By affirmative action I mean *seeking out* undergraduate students of minority groups and *dealing directly with the reasons* they do not enter graduate school in agricultural economics.[9] Much to our credit, we have done this for foreign students. We have found other ways to evaluate the potential of foreign students because our traditional criteria (quality of the undergraduate school, grade point average, and GRE scores) are not appropriate. But we have failed to apply the same reasoning to domestic minorities. We continue to search for undergraduate students in the big-name, predominantly white schools and we do not recognize the cultural bias in the graduate record exams.

If it is minority talent that we seek, we will have to use the same ingenuity we have applied so effectively in recruiting students from other countries. We need to search for this talent in high schools as well as colleges, for we do not have a large number of minority students majoring in agriculture at the undergraduate level. One obvious way to do this is to participate in the undergraduate minority program which most universities sponsor. At Wisconsin, 500 minority students are in this program, and virtually all were unacceptable by normal entrance requirements. Yet in the seven-year history of the program, a higher percentage of these students have finished college than have all undergraduate students.

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[8] While this argument is generally valid, there is some counterfactual evidence. For example, when Glen Pulver was hired as a dean in the University of Wisconsin Extension Service, there were two Blacks on the *entire* extension staff of the university. Two years later there were 19, and 17 were in Pulver's division.

[9] Departments in universities and colleges could take some lessons from the Economic Research Service of the USDA which has a very active affirmative action program that reaches into both the undergraduate and graduate levels of predominantly black institutions.

The AAEA could play an important leadership role in recruiting minority talent at both the high school and undergraduate levels. To this end, I suggest the formation of a Committee for the Recruitment of Minorities. This Committee would recruit minority students in predominantly black high schools and colleges, both directly and by coordinating recruiting activities of agricultural economics departments; solicit funds from foundations and AAEA members to supplement association monies for scholarships for minority undergraduate and graduate students;[10] and encourage agricultural economics departments to set aside, perhaps, one research assistantship each year for support of a minority graduate student. These efforts would bring greater awareness of minority problems to the profession as well as doing some concrete good in terms of getting minority students to major in agricultural economics.

In addition, the profession should recruit more women to major in agricultural economics. We would probably find that the female perspective would greatly enhance the development of our currently inadequate theories of household behavior with respect to decisions on expenditures, productivity of household labor, and the work/leisure choice of both husbands and wives.

Conclusion

To conclude, I would like to urge that we pay attention to the message we have been hearing over the past decade from many of the respected people in our profession. The message is that we are only peripherally involved, if at all, in most of the important social issues, policies, and programs affecting the well-being of rural people; we are in danger of becoming a socially irrelevant profession. It is not that we are becoming more apathetic or parochial, but that society's views are changing with respect to the importance of the problems that have historically preoccupied us. I suggest that a rethinking of priorities and a broadening of scope in terms of the problems we work on and the people we serve is not only desirable, but may be necessary for our long run survival.

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[10] In the absence of a sizeable grant, these AAEA scholarships might be largely symbolic because of limited funds, but it would be an important and highly visible step to take.

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PRESIDENTIAL ADDRESS

Adjustment Problems and Policies Within a Framework of Political Economy*

G. I. TRANT

IN COUNTRIES as large and diverse as Canada and the United States, an annual crop of short-term crises in at least some commodities is as perennial as the grass. In the absence of an adequate formula for a preemergent problem solving policy, decision makers are often accused of using *ad hoc* solutions that have unfortunate residual side effects. In some instances so much attention is focused on these short-term crises and the instruments used to deal with them that casual observers of the agricultural scene, and some not so casual, have decried the lack of a policy for agriculture. By this they mean that there does not appear to be any set of enduring ingredients that can be identified as the agricultural policy of the nation. At first glance, it must appear that such criticism is soundly based—for example, the recent surge in North American food prices and the instruments used to control them. However, the basic elements of agricultural policy have been remarkably stable over a long period of time in both Canada and the United States. Furthermore, their respective policies are remarkable for their parallelism rather than for their differences. Differences have existed but these have been primarily matters of the choice of policy instruments and the level at which each nation wished to and could afford to apply them.

Common elements of the agricultural policies of both nations include the following:

(1) to develop agriculture with an orientation to international trade;[1]
(2) to increase agricultural productivity;
(3) to allow competition among producers a large role in resource allocation;
(4) to encourage the family controlled farm business unit;
(5) to support capital intensiveness;
(6) to increase stability of agriculture.

These common points of policy are of sufficient importance to justify a brief examination of each.

The development of agriculture with orientations toward international trade has been a consequence, in both countries, of the basic nature of their agricultural resource endowments relative to effective domestic demand. Both have had and will continue to have a vital interest in earning foreign exchange. Active support to agriculture to permit it to be competitive in foreign markets has been given by the support of production research, as noted below, as well as in terms of credit policies and the development of appropriate infrastructures to serve both agricultures.

The classical economic view of population growth and food supply encouraged the development of government supported research for agriculture on a fairly large scale in both countries In the United States, considerable reliance was placed on the use of the mechanism of the experiment station in conjunction with the Land Grant college to achieve long-term productivity objectives. In Canada comparatively greater use was made of the federally-financed experimental stations and separate Provincial Colleges of Agriculture with less emphasis on the close linkage of agricultural college and experiment station. This emphasis on continuing research, to a considerable degree focused on production problems and their solutions, has resulted in the maintenance and development of the comparative advantage of both agricultures in relation to international markets.

Although there certainly have been exceptions to the free working of the competitive system on both sides of the border, fluid milk production being a case in point, nonetheless, both countries are close to being free trade areas for most practical purposes. They have moreover been more willing than most to expose fairly

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* The author wishes to thank his colleagues, W. J. Anderson and B. B. Perkins, for helpful comments and suggestions in the preparation of this paper.

[1] Several of the items in this list are drawn from an article entitled "Alternatives in Economic Policy for Canadian Agriculture" by W. J. Anderson which appeared in Vol. 7, No. 2 of *Canadian Farm Economics*, Economics Branch, Agriculture Canada.

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large segments of their agriculture to international markets. Support of the family farm or at least the encouragement of small nonintegrated family controlled farm business units has generally been a policy in both countries with perhaps more regional differentiation being exhibited in the United States.

A shift to capital intensity has logically evolved from favorable credit policies and the nature of labor-saving technological changes which have been capital using. Comparatively good alternative opportunities for farm labor have encouraged the shift to capital intensive agriculture in the United States and Canada. Instability of yields, prices, markets, and income have characterized both agricultures. Although because of its geographic diversity total agricultural production has been relatively more stable in the United States than in Canada, instability problems for individual commodities and regions have been of significance in both agricultures. Continuing efforts to reduce yield instability have been a continuing aspect of production research in North America. Both countries have also had price stabilization programs as a significant part of their overall agricultural policies for many years.

The above comments indicating enduring elements in the agricultural policies of both countries strongly suggest that an important part of these policies has been anything but *ad hoc* in nature. The basic policy thrusts indicated above have received remarkably consistent support despite changes in governments, although it must be noted that there have been significant modifications in emphasis from time to time. Basically the reasons for apparent random elements in agricultural policy may be attributed to problems with individual commodities, diversity of interests, and comprehensiveness of agricultural policy. It is doubtful that there will ever be a year or even month in which some individual commodity in North America is not encountering a serious crisis situation whether it is frost damage to orchards, insects or diseases in field crops, the loss of a favored market, or the emergence of an unsuspectedly efficient competitor. Each situation will require rapid attention and frequently a short-term policy or program to deal with it.

A related matter which tends to aggravate problem situations with individual commodities and which has certain problem characteristics of its own is that of diversity of interests. This diversity of interests exists between agriculture and the rest of the economy, between regions, between producers of competing crops, and between producers and users of the same commodity. Strong regional dependence on a single commodity can convert a production or market problem into a regional crisis. In brief, because of the high degree of interrelatedness in agriculture, few adjustments can take place that do not change the relative position of one group of persons to another.

Comprehensiveness of agricultural policy is another reason for its frequently being misjudged. Agricultural policy, unlike that for other sectors of the economy, tends to give greater emphasis to issues explicitly involving the welfare of farm people, rather than dealing with the problems of an industry qua industry. Many of the criticisms of agricultural policy might be more meaningful if agricultural policies were compared to those for other industries or perhaps to the agricultural policies of other countries.

Having dealt in a very brief way with some of the criticisms that have been leveled at agricultural policy, it is appropriate to move on to discuss at least one of the major issues facing North American agriculture, namely that of international markets. Agricultural exports, more specifically cereal grains, offer both the United States and Canada an opportunity to exploit considerable comparative advantage. In this area in particular, they are most competitive with one another, not only in off-shore trade but in their own domestic markets as well. On purely economic grounds there is little doubt that the agricultures of both countries would benefit from an increased liberalization of world trade in agricultural commodities. It is also true that in the absence of either free trade or satisfactory bilateral arrangements with third nations, both agricultures would have to undergo wrenching resource adjustments rather than continued expansion and development.

There are some who may argue that present food prices in North America presage a new demand pull supported plateau of affluence for agriculture which requires only increased production for its exploitation, and hopefully they are right to some extent. A realistic view of longer term projections, however, suggests that the problems attendant on surplus production of cereal grains are more likely to be the normal expectation for some years to come than the bonanza conditions of the present. Consequently, the GATT negotiations that are now in preparation still assume enormous importance for the future of North American agriculture. While the issues to be discussed are economic and the discussions themselves will be to a large degree technical, the negotiating positions and the acceptability of alternate trade-offs by individual countries will largely be determined by their domestic political acceptability. It is belaboring the obvious to observe that a free trade position on the part of one negotiating nation will be inconsistent with a high domestic support price policy of another; at the same time parallelism of domestic policies may also produce conflict at the negotiating table. There is little doubt that the most significant results for international trade in agricultural products of the GATT negotiations will come about as a result of the balance of positions to be achieved between the EEC, the United States, and Japan. Canada, despite its importance in international trade in agricultural products, will be restricted in its scope of action by this fact. At the same time, of course, it is expected that Canada will be able to make meaningful modifications to the general thrusts of the results. Leaving the arena of multilateral negotiations for the bilateral one, it is again noted that political considerations will be as important as ever. By their nature, bilateral negotiations have greater negotiating scope for smaller nations than multilateral ones although the results may be less acceptable on economic grounds.

International trade and domestic policy for agriculture are closely related items for most countries. A good deal of effort is usually directed toward a separation or at least a mitigation of the effects of external forces on domestic policy issues. Canadian agriculture presents special economic and political problems in this respect. The diversity of natural resource endowment is a good deal greater in the United States than in Canada but the problems of regional issues in Canadian agriculture tend to be magnified by geographical, political, and economic considerations which have resulted in a wide physical separation of producing and consuming regions. The economic aspects of adjustment issues, which are related to income distribution among producers within agriculture, are rendered even more complex by other factors. For one thing, the responsibility for agriculture is perhaps more widely shared between federal and provincial governments in Canada than it is between corresponding levels of government in the United States. For another, the location and resource endowments of certain provinces, particularly in the Atlantic region, do not readily lend themselves to the development of a highly competitive feed-grain livestock complex even though they are deficit regions for these commodities and in some instances their economies are highly dependent on agriculture.

These complex political economic problems place a special responsibility on the agricultural economist in Canada. Agricultural economists who work at one of the two levels of government in Canada directly involved in agriculture have an obvious responsibility in the policy area in terms of making the most competent analysis of policy issues for presentation to policy makers that time and circumstances will permit. While they have wide scope for comment and constructive criticism before policies are implemented, their positions hardly suit them for the role of public autocriticism after the fact. If they do criticize the policies of similar or different levels of government, there is the ever present problem of not only being disinterested but also of getting others to believe that they are. A similar problem is faced by the publicly supported private consultant or researcher.

There is, therefore, in Canada a need for sound, informed comment and suggestion about policy matters that may perhaps be best supplied by agricultural economists at Canadian universities, although this void might also be at least partly filled by greater well-informed in-depth coverage of the issues of agricultural policy by the press. It would be easy to say that Canadian university departments of agricultural economics have not made as much useful comment on significant agricultural policy issues as they should and the problem would be solved were they to do more of it. Such a statement would be grossly unfair. With perhaps two exceptions they are very hard pressed for resources to carry out essential teaching and teaching associated research. However, the problem goes deeper than that of resources alone. Greater involvement on the part of university economists in the actual process of policy formulation and evaluation is required if they are to become aware of the complexity of issues involved in policy formulation. Individuals will have to become interested in the area of national as well as provincial agricultural policies. In order to move from the interest stage to the doing stage, they will require the support and approval of their departments, their universities, and their provinces. Farm organizations as well will have to give encouragement to this type of participation by university economists in the process of strengthening Canadian agricultural policies. The contribution which our university departments of agricultural economics can make to solving agriculture's problems and capturing its opportunities is too important to be wasted. Last year's Workshop on the Agricultural Economist's Contribution to Policy Formulation was an excellent start in the right direction. Let us not lose the initiative.

Sectional Meeting E

AGRICULTURAL ADJUSTMENT: SELECTED PROGRAMS AND PROJECTS

Chairman: Walton J. Anderson, Agriculture Canada, Ottawa

Adjustments in a Slowly Declining U. S. Cotton Production Industry*

Robert S. Firch

During the last 20 years the U. S. cotton production industry has endured such sweeping changes in government policy that many observers of the scene may have failed to notice that it has been what the economist may reasonably classify as a declining industry. If the prime criteria for identifying a declining industry is that the aggregate demand for its product is shifting to the left, then Figure 1 leaves little doubt that U. S. cotton production is a declining industry. The leftward shift of the demand curve is even more obvious in Figure 2, which presents cotton consumption in per capita terms. Cotton is by no means unique in this respect as many other agricultural commodities have experienced declining per capita consumption.

The downward trends in the total quantity of cotton consumed domestically and exported have occurred at very slow rates as indicated in Table 1. If prices had been trendless over this period of very slowly declining consumption, it would be reasonable to classify the U. S. cotton production industry as static rather than declining. However, dramatic downward trends in the real prices paid by users of cotton in both the U. S. and foreign countries occurred during the 1953–72 period as shown in Table 3.

This paper will analyze the adjustment problems associated with U. S. government efforts to balance supply with demand while maintaining gross receipts to U. S. cotton growers during 1953–72. These adjustments were carried out in the context of a slowly declining demand with the government policy probably being a major contributor to the decline in demand. The cotton programs were successful in maintaining gross receipts, at least as measured in current dollars (Table 3). These programs undoubtedly contributed to substantial inefficiencies in production and major adjustments in the value of the rights to produce cotton, the number of farmers engaged in cotton production, and total acres planted to cotton. It will be argued in this paper that the U. S. government through its policies effectively set the price for both domestic and foreign grown cotton during most of this period. In this way profound adjustments have also been required of foreign producers of cotton.

The twenty-year period will be divided into three parts in order to expose better the distinctively different policies in effect during these three subperiods. The dominant features of the first period, 1953–55, were high price supports with high prices to domestic and foreign producers and consumers of cotton. The second period, 1956–65, was a period of sharply reduced prices for foreign producers and consumers, high prices for U. S. producers, and high prices for U. S. users of cotton, except in the last two years of the period when subsidies were paid to U. S. cotton mills. In the third period, 1966–72, direct subsidy payments to U. S. producers and low support prices resulted in low market prices in both U. S. and foreign markets. Beginning with the 1969 cotton crop, U. S. cotton producers have had substantial freedom to plant acreages of cotton beyond that required for full participation in the benefits of government programs. The planting performance of this period will be analyzed because it provides considerable insight to the adjustments in size and location of the U. S. cotton production industry that

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* I am indebted to C. Curtis Cable Jr. for his review of an early draft of this article, which is in part a product of our continuing dialogue on the condition of the markets for cotton. Arizona Agricultural Experiment Station Journal paper 2156.

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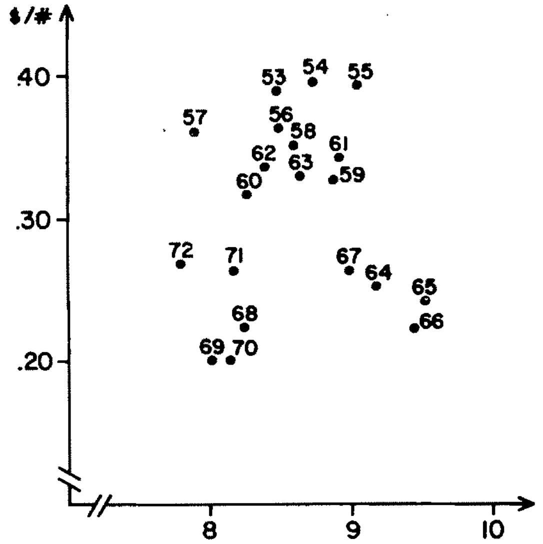

Figure 1. Millions of bales of domestically consumed upland cotton related to prices paid by mills, 1953–72 (crop-year basis) Source: Tables 1 and 3

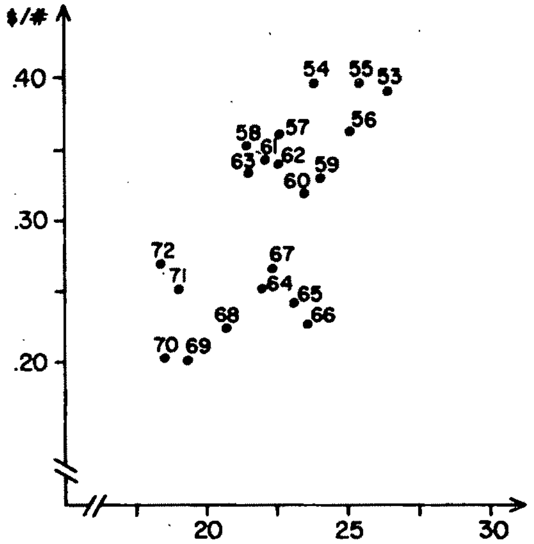

Figure 2. Pounds per capita of cotton consumed in the U. S. related to prices paid by mills, 1953–72 (calendar-year basis) Source: Tables 1 and 2

would occur with no U. S. government program for cotton.

1953-55—A Period of High U. S. Price Supports for Cotton

The year 1953 was the last year that the direct effects of the Korean War were expressed in the markets for cotton and government programs for cotton. Because of the booming worldwide demand for cotton during the War, all government restrictions on cotton planting in the U. S. were removed during the 1951, 1952, and 1953 crops. Figure 3 represents the U. S. and foreign market conditions that prevailed during 1953–55. The price P_e is the equilibrium price that would have prevailed without U. S. government interference in these markets. At this price the excess supply in the U. S. market is exported to and is equal to the excess demand in the non-U.S. market. However, the U. S. government established a supported price P_s substantially above the free market equilibrium price and made it effective through a program of nonrecourse loans through the Commodity Credit Corporation. Any U. S. cotton that could not be absorbed in either the U. S. or non-U. S. markets at the high P_s price was absorbed in C.C.C. warehouses.

At price P_s in Figure 3, the excess supply in the U. S., $(Q_b - Q_a)$, greatly exceeds the excess demand in the non-U. S. market, $(Q_d - Q_c)$. Because of this, the U. S. has been characterized by Horne [3] and Whitaker [5] as playing the role of "residual supplier" of cotton for the U. S. and foreign markets. Research using slightly different price series than those reported in this paper for the period 1953–66 revealed a simple correlation of .96 between the price at which cotton was available from the C.C.C. stocks and the price of cotton in Liverpool, England, which is widely accepted as representing

Table 1. Probable cotton prices expected from cotton grown under government programs in effect in 1972

	1972 Cents per pound
Expected price from sale in the market	29–35
Price support payment on projected yield if 100 percent of paying base is planted	15.00
Effective price support payment on projected yield if 90 percent of paying base is planted	16.67
Expected revenue from planting 90 percent of paying base	46–52
Expected revenue from planting beyond 90 percent of paying base	29–35
Price support for middling 1-inch cotton at average location	19.50

Table 2. Statistics on production and disposition of U. S. grown upland cotton, 1953–72 (1000 bales)

Year	Production	U. S. Mill Consumption	Exports	Carry-over August 1	CCC Stocks August 1
1953	15,907	8,476	3,760	5,511	2,000
1954	13,190	8,730	3,445	9,570	7,035
1955	14,187	9,085	2,194	11,028	8,133
1956	12,697	8,496	7,540	14,399	9,857
1957	10,635	7,974	5,949	11,388	5,184
1958	11,197	8,682	2,870	8,665	2,923
1959	14,306	8,886	7,393	8,775	7,042
1960	14,031	8,121	6,849	7,410	5,041
1961	13,993	8,754	5,049	7,073	1,446
1962	14,428	8,236	3,427	7,717	4,688
1963	14,885	8,467	5,772	10,988	8,017
1964	14,872	9,013	4,173	12,125	10,232
1965	14,683	9,356	3,030	14,021	11,397
1966	9,474	9,343	4,818	16,575	12,077
1967	7,117	8,857	4,345	12,270	5,600
1968	10,841	8,122	2,816	6,259	57
1969	9,905	7,921	2,862	6,370	2,799
1970	10,129	8,025	3,886	5,683	2,937
1971	10,253	8,082	3,378	4,223	271
1972	13,606	7,700[a]	4,800[a]	3,309	215

Source: USDA, ERS, *The Cotton Situation,* various issues.

[a] Estimated values since the 1972 marketing year had not been completed at time of writing.

Table 3. Statistics on planted acres, yield, and per capita consumption of all U. S. grown cotton, 1953–72

Year	Planted Acres (1,000 Acres)	Yield per Harvested Acre (Pounds)	Pounds per capita Consumption	
			Cotton	All Fibers
1953	26,872	324	26.4	38.8
1954	20,052	341	23.9	35.4
1955	17,991	417	25.4	39.4
1956	17,077	409	25.1	38.0
1957	14,310	388	22.6	35.2
1958	12,379	466	21.4	33.6
1959	15,833	461	24.1	38.7
1960	16,080	454	23.2	35.9
1961	16,588	438	22.2	35.7
1962	16,293	457	22.5	37.8
1963	14,843	517	21.4	38.3
1964	14,836	517	22.1	40.5
1965	14,152	527	23.1	43.7
1966	10,349	480	23.6	45.8
1967	9,448	447	22.3	45.3
1968	10,912	516	20.7	48.8
1969	11,882	434	19.4	48.4
1970	11,945	438	18.6	46.7
1971	12,355	438	19.1	51.6
1972	13,903	507	18.4[a]	55.5[a]

Source: USDA, ERS, *The Cotton Situation,* various issues.

[a] Estimated values since the 1972 marketing year had not been completed at time of writing.

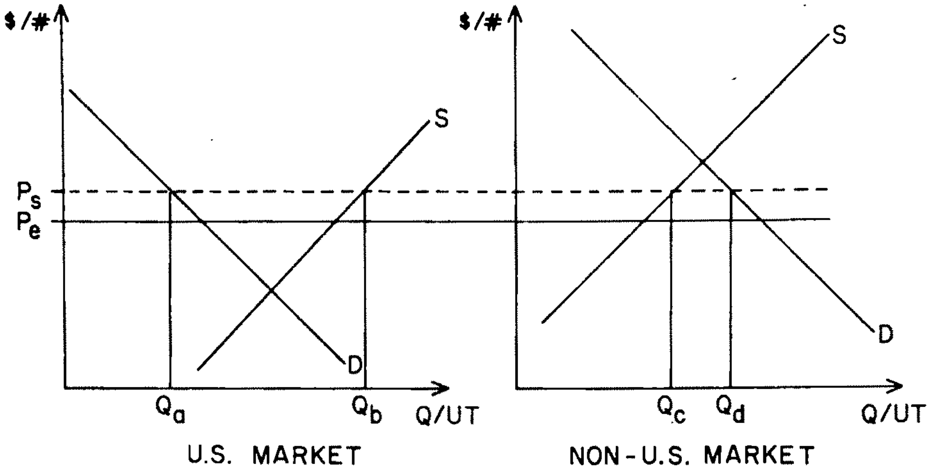

Figure 3. U. S. and foreign cotton markets with high U. S. price supports, 1953–55

the "world price" for cotton [1]. It is rather conclusive that U. S. cotton programs effectively set the price of cotton not only for U. S. producers and consumers but also for non-U. S. producers and consumers.

After the 1953 crop was grown without restrictions on planting, the C.C.C. absorbed nearly one third of the crop at the end of the marketing year on August 1, 1954. It was obvious that the C.C.C. stocks could not be allowed to increase at this rate indefinitely, and so cotton planting was substantially reduced by reinstating the acreage allotment program in 1954. This restriction in the number of acres that could be planted is equivalent to shifting the supply curve in the U. S. market of Figure 3 to the left. The U. S. was destined to retain its status as world-wide price maker for cotton as long as it did not effectively shift the U. S. supply curve too far to the left. As long as the excess demand in the non-U. S. market exceeded the excess supply in the U. S. market by less than the C.C.C. stocks at the beginning of the particular crop year, U. S. control of the price would continue. The restriction on number of acres that could be planted combined with the supported price well above the free-market price provided the incentives for substantial increases in per acre yields. The increased yields canceled much of the intended effect of reducing the number of acres planted and assured a continuation of the U. S. as a major controller of world-wide cotton prices.

The high price guaranteed by U. S. policy provided ample encouragement for foreign countries to expand cotton production, partly through the development of large scale irrigation projects. Since cotton producing countries other than the U. S. are generally at much lower levels of economic development, the high world-wide price maintained by the U. S. during 1953–55 was probably one of the more effective programs that the U. S. has had for encouraging the development of less developed countries. However, a continuation of the policy would probably have meant that the U. S. would have effectively ended its role as a cotton exporter by the end of the 1950's. Without an export market for cotton, the U. S. would have had to shift a large share of the land previously used in cotton production to other uses, and it would have become exceedingly difficult to maintain the income of cotton producers.

1956-65—A Period of High U. S. Price Supports and Major Efforts to Maintain the "Traditional" Export Market for U. S. Cotton

With C.C.C. stocks increasing and the exports declining during the period 1953–55, it became obvious that some major changes in policy would be required to reverse these disturbing trends. Public Law 480 was approved in 1954 but was applied to cotton exports of only about 500,000 bales of the 1955 crop. Through expanded use of its various provisions, including special credit terms and sales for local currencies, Public Law 480 substantially expanded the foreign demand for U. S. grown cotton. During the period 1956–70, exports under Public Law 480

Table 4. Statistics on gross receipts, mill price, and Liverpool price of U. S. grown cotton, 1953–72

	Current Dollars (1,000 Dollars)			1958 Dollars,[b] (Cents per pound)	
Year	Cash Receipts Lint & Seed	Goverment Payments	Gross Receipts	Mill Price	Liverpool Price
1953	3,179		3 179	39.2	42.2
1954	2,702		2,702	39.9	42.7
1955	2,580		2,580	39.6	37.2
1956	2,500		2,500	36.5	31.6
1957	1,756		1,756	36.1	31.0
1958	2,138		2,138	35.2	28.7
1959	2,647		2,647	33.0	26.1
1960	2,340		2,340	32.0	27.4
1961	2,482		2,482	34.4	27.9
1962	2,552		2,552	34.0	26.7
1963	2,838		2,838	33.5	25.4
1964	2,521	39	2,560	25.4	26.3
1965	2,330	70	2,400	24.3	24.0
1966	1,588	773	2,361	22.9	22.5
1967	1,095	932	2,027	26.7	24.0
1968	1,316	787	2,103	22.5	22.4
1969	1,403	828	2,231	20.1	21.0
1970	1,254	919	2,173	20.6	22.8
1971	1,470	822	2,292	26.3	26.6
1972	1,906	807	2,713	27.0[a]	27.0[a]

Source: USDA, ERS, *The Cotton Situation,* various issues.

[a] Estimated values since the 1972 marketing year had not been completed at time of writing.

[b] Deflated by the GNP Implicit Price Deflator for the private sector.

were a substantial portion of total cotton exports, and in some years far exceeded strictly commercial exports [2, p. 33]. As illustrated in Figure 4, Public Law 480 had the effect of shifting the non-U. S. demand to the right, reducing the discrepancy between excess demand and excess supply at the P_s price.

The Agricultural Act of 1956 included the Soil Bank program which allowed the government to lease land from production, and this

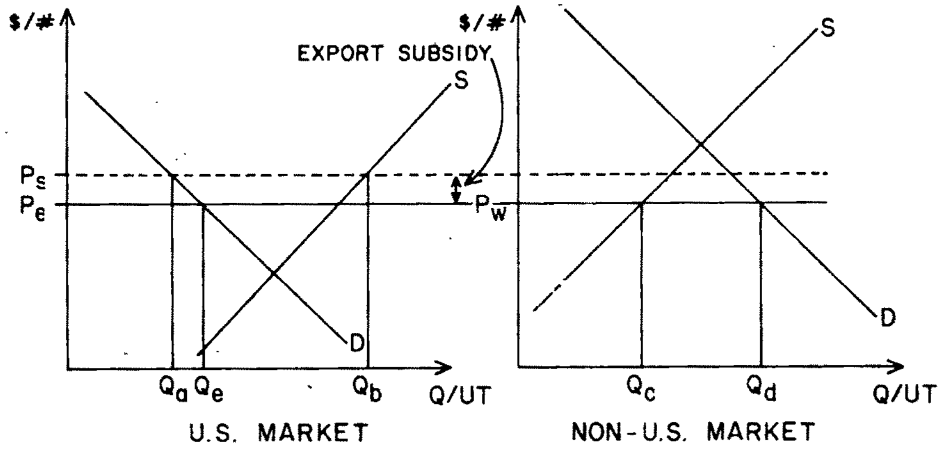

Figure 4. U. S. and foreign cotton markets with high U. S. price supports and export subsidies, 1956–65

did reduce the acreage of cotton harvested in 1956–58. Title II of the Act directed the C.C.C. to sell all of its surplus by offering it for sale at prices competitive with world market prices. Under this authority the C.C.C. in 1956 and 1957 sold cotton to exporters at prices averaging six to eight cents below the price support level at which it had been purchased from farmers. This export subsidy is depicted in Figure 4 by the difference between the U. S. market price P_s and the non-U. S. price P_w.

The combination of the lower price to foreign buyers, the activities under Public Law 480, and the reduced plantings due to the Soil Bank program caused the excess demand in the non-U. S. market to exceed by far the excess supply in the U. S., and C.C.C. stocks were sharply reduced in 1956 and 1957. In other words, the demand in the non-U. S. market of Figure 4 shifted to the right and the supply of the U. S. market shifted to the left so that $Q_d - Q_c$ exceeded $Q_b - Q_a$. Starting with the 1958 crop and continuing through the sale of the 1965 crop, the export subsidy was an explicit and fixed amount for each crop year with a range of 5.75 to 8.50 cents per pound for each of the specific years.

During the period 1956–63 U. S. users of cotton became very concerned about the growing imports of products manufactured from cotton in other countries where the price of raw cotton was lower than that available to them. To appease the U. S. cotton mills a domestic subsidy was begun in 1964 and continued through the 1965 crop year. In terms of Figure 4, this was equivalent to lowering their effective price to the P_e level which would cause them to expand their use of cotton from Q_a to Q_e with obvious benefit in helping to solve the "surplus problem."

By 1964 the U. S. textile mill industry was already highly concentrated with the consequence that a relatively small number of firms received very large checks from the government in order to carry out the intent of the domestic cotton subsidy. The visibility of these large payments made the mill firms very uncomfortable and they insisted that the farmers should directly receive the payment and the associated notoriety since they were the ultimate beneficiaries of the subsidy.

In 1959 and 1960 the U. S. support price for cotton was started on a downward course with the expectation that it might some day be allowed to reach a level more consistent with the free-market price. But in 1961 a new administration in Washington raised the support price slightly and held it at the higher level for three years before lowering it in 1964 and 1965.

Because there were substantial reductions in the C.C.C. stocks of cotton during the 1957 and 1958 crop years, the planted acreage of cotton was allowed to increase substantially during the 1959 crop and remain at this high level until the large increase in C.C.C. stocks in 1962 indicated that this level of planting could not be sustained without excessive buildup of C.C.C. stocks. Although the total acreage allotment was lowered for the 1963–65 crops, increased yields more than offset the reduced number of acres. The combination of high support price, relaxed planting restrictions, and increased per acre yields resulted in an excess supply in the U. S. market that greatly exceeded the excess demand in the non-U. S. market over the 1961–65 crop years.

The lower price in the non-U.S. market for cotton during the 1956–65 period that resulted from the U. S. export subsidies probably resulted in a price that was not substantially higher or lower than the average price that would have prevailed without any U. S. government intervention in the markets for cotton. Because the U. S. continued to operate as an effective "residual supplier" and retained control of the foreign price throughout this period, the result must certainly have been more stable cotton prices than would have occurred without U. S. government intervention. The stabilized prices would have to be considered encouraging to the development of foreign cotton production and also the economic development generally of less developed countries. On the other hand, Public Law 480 activities were most likely negative on balance as they affected the development of agriculture in these countries. It appears that the net effect of all the U. S. policies affecting the non-U. S. market for cotton was neither to encourage nor discourage substantially economic development of the less developed countries during 1956–65.

The umbrella of high and stable cotton price that encouraged foreign cotton production during the 1953–55 period was continued for the synthetic fiber industry for the 1956–63 period. The high cotton price during this period largely exempted the synthetic fiber industry from competitive pressure to lower prices. In this way U. S. cotton policy helped to provide the wherewithall and encouragement to speed the technical development and market penetration of the polyester fibers. From a U. S. market share that was virtually zero in 1960, the polyester fibers in 1972 approached the market share of cotton.

In the early 1960's the cotton industry introduced the chemical process and marketing concept of "permanent press" garments on the expectation that it would be applied only to all-cotton fabrics. Slacks that reached the market made from all-cotton fabric were indeed "permanent press," but the process required to establish this characteristic so weakened and embrittled the cotton fiber that the cuffs and creases wore through in three or four wearings and washings [5, p. 99]. The only way that the intense new demand for "permanent press" garments could be reasonably satisfied was to make them from fabrics containing substantial content of synthetic fibers for their strength and abrasion resistance. By the end of the 1960's the all-cotton shirt was a rare and expensive commodity.

The current popularity of "permanent press" garments made from blended fabrics combining the strength of synthetic fibers with the comfort of cotton coupled with very skillful and well-financed merchandising by the synthetic fiber industry is the primary explanation of the strong upward trend in per capita consumption of all fibers. Per capita consumption of cotton has continued its downward trend in spite of a sharp reduction in the effective price of cotton to the mills in 1964 (Tables 2 and 3). Because of the "permanent press" and blend phenomena, it appears likely that there were important elements of economic complementarity between cotton and the synthetic fibers by the end of the 1960's.

1966-72—A Period of Low Price Supports and the End of the U. S. Role of World-Wide Price-Maker for Cotton

In the 1962, 1964, and 1965 crop years the production of cotton in the U. S. substantially exceeded the quantities consumed domestically and exported. C.C.C. inventories and carry-over of cotton grew at alarming rates. At the beginning of the harvest of the 1966 crop, the carry-over exceeded the production of any year since 1937. The Agricultural Act of 1965 shifted the cotton program from high price supports and domestic and export subsidies to low price supports, direct payments to cotton growers, and no subsidies to domestic users or exporters of cotton. The program as detailed by the Secretary of Agriculture provided strong incentives for producers to reduce acres planted in 1966 and 1967. Lower yields, particularly in 1967, resulted in a sharp reduction in cotton production, with the production in 1967 less than half the production of any of the years of the 1962–65 period. The sharp drop in production combined with relatively good export years in 1966 and 1967 allowed the carry-over to drop by over 10 million bales in this two year period.

Figure 5 depicts the conditions of the U. S. and non-U. S. markets for cotton as they are believed to have existed during the 1966–72 period. With the support price P_s set below the free market equilibrium price P_e, the price P_s can exist in the markets only during each year that C.C.C. stocks exceed the difference between $Q_d - Q_c$ and $Q_b - Q_a$. Non-U. S. producers and non-U. S. and U. S. users of cotton would be responding to price P_s as long as C.C.C. stocks are sufficient to maintain that price.

The basis for the direct payments varied somewhat from year-to-year during 1966–72. Producers with relatively high production costs per pound of lint were generally basing their decisions on the total of price P_s plus the direct payment which would be above P_e. Producers with relatively low production costs would base their marginal production decisions on price P_s. Figure 5 indicates that U. S. producers "average" response was probably equivalent to a price not substantially different from the price P_e.

The swift reduction of the carry-over stocks combined with the prospect of the very small crop in 1967 and a relative shortage of the longer staple length cottons caused a speculative run-up in price, and almost all of the remaining C.C.C. stock moved into speculative ownership. In 1967, for the first time since the Korean War, the C.C.C. stock of cotton was insufficient to assure that the excess supply of the U. S. market plus the C.C.C. stocks were more than the excess demand of the non-U. S. market. In terms of Figure 5, the supply in the U. S. market had been shifted to the left by the government programs, and the demand in the U. S. market had shifted to the right by speculative interest to such degrees that $Q_d - Q_c$ exceeded $Q_b - Q_a$ by more than the quantity of cotton remaining in the C.C.C. stocks at the beginning of the 1967 crop year. The U.S. loss of its role as cotton price-maker for the world was short-lived as both acres planted and yields increased and ex-

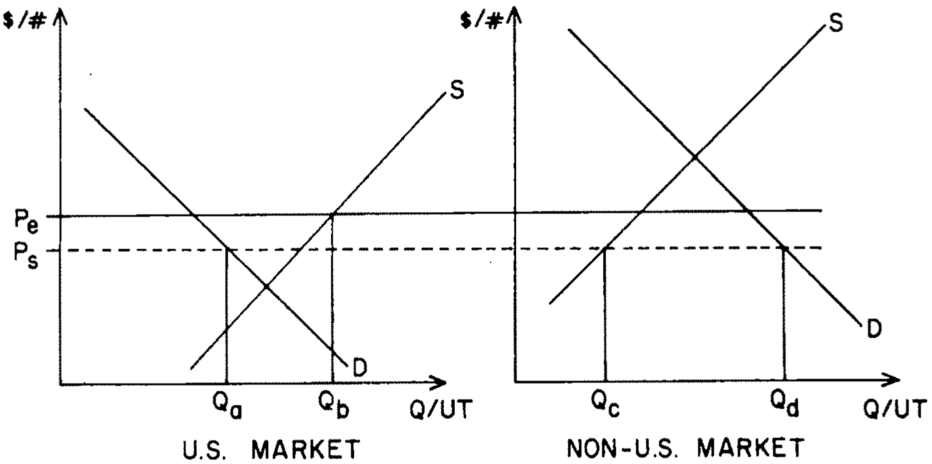

Figure 5. U. S. and foreign cotton markets with low U. S. price supports and subsidies paid directly to producers, 1966–72

ports decreased in 1968. The quantity of cotton held for speculative purposes through the 1967 crop year passed back to C.C.C. by the end of the 1968 crop year, and the U. S. support price once again effectively set the U. S. and non-U. S. cotton price for the 1968–70 crop years.

The surprisingly rapid reduction of the C.C.C. stocks in 1966 and 1967 allowed the possibility of expanded production of cotton in 1968. The 1969 and 1970 programs allowed individual cotton growers to earn their maximum government payments by planting at least 90 percent of their domestic allotments, which were 65 percent of total allotments. Cotton planting by individual farmers could be expanded to their total allotments, but only the market price with a very low support price could be expected on cotton planted beyond the 90 percent of the domestic allotment. Cotton could be planted beyond the total allotment under a special export program, but its provisions were so unattractive to cotton growers that it was not used to an important extent. Planted acres expanded under the 1969 and 1970 programs, but lower yields more than offset the increased acreage and carry-over stocks continued a slow decline.

The Agricultural Act of 1970 became effective with the 1971 crop. This program, as defined by the Secretary of Agriculture for the 1971 and 1972 crops, specified a base acreage allotment for each cotton farm that was about nine percent greater than the number of acres of the domestic allotment under the 1970 program. In order to qualify for the maximum price support payment from the government, the cotton grower had to plant at least 90 percent of the base allotment that he controlled and set aside or idle a land area equal to 20 percent of his base acreage allotment plus the conserving base acreage for his farm. There was no upper limit on land that could be planted to cotton by program participants after the set-aside and conserving base requirements of the program were satisfied. Someone willing to plant cotton without price support payments or access to the loan program had no government imposed upper limit on cotton planting.

In the 1966–70 crops, domestic consumption plus exports exceeded production in each year and carry-over continued to decline. The expectation of very low carry-over into the 1971 crop year caused virtually all of the remaining C.C.C. stocks to be drawn into private ownership. The large C.C.C. stock, a necessary condition for the U. S. to retain its price controlling position, no longer existed and with the excess demand in the non-U. S. market ($Q_d - Q_c$ in Fig. 5) continuing to exceed the excess supply in the U. S. market ($Q_b - Q_a$), the price of cotton in U. S. and foreign markets moved above that implied by the support price P_s. By 1972 it was clear that the support price was well below the price that would have prevailed without any U. S. government intervention in the market, and only the disposal of the C.C.C. stocks accumulated before the 1966 crop allowed the price for the 1966 and 1968–70 crops to be held at the low support price level.

During the C.C.C. disposal period of 1966–70, except 1967, the price of cotton in the non-U. S.

market was surely pressed below what it would have been without any U. S. government intervention. This sub-free-market price imposed by U. S. cotton policy must surely have been discouraging to the development of a number of less developed countries just as the 1953–55 policy must have been encouraging. The discouragement of non-U. S. production during 1966–70 was of course beneficial to U. S. cotton growers.

It appears that major adjustments have occurred in asset values during the last 20 years which have gone largely unnoticed. Relatively little data exists by which to judge the true magnitudes of these changes. Regression analysis was applied to sales prices of cotton farms in Central Arizona to attempt to estimate the market value of acreage allotments [4]. Only limited confidence can be placed in the results because only 51 farm sales spanning the period 1961–67 were judged to be appropriate for the analysis. Because of the methodology used in the analysis, it is believed that the results tend to understate the pure market value of the allotments.

Year	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
Value of allotment per acre with value of associated land extracted	$960	$1190	$1220	$1110	$950	$745	$550

The results of the regression analysis indicated that during this period the market value of cropland without cotton allotments also fell in value. This probably represents some further effect of the declining profitability of cotton production in the area.

The drop in value of cotton allotments seems to have been associated with a decline in the profitability of cotton production in the area because of a severe insect control problem and uncertainty about continued availability of the benefits of the cotton program. Direct payments, particularly to the large farms of Arizona, made the real cost of the cotton program abundantly obvious to the taxpayers. The flow of net revenue that could be attributed to allotments in central Arizona in the early 1960's was probably among the highest of any area of the U. S. on a per acre basis, but more importantly, central Arizona was probably even less representative of average U. S. value of allotment per pound of potential yield.

Cotton acreage allotments have been the basis for full participation in the benefits deriving from the government programs from 1954–72 and an absolute requirement for cotton planting during the period 1954–70. The government programs controlling the allotments have not allowed any significant transfer of allotments across state lines since 1954. Acreage allotment transfer across county lines have only been allowed in recent years. Except for some minor flexibilities in the programs for the 1959 and 1960 crops, the only interregional movement of production that could occur before the 1969 crop was that deriving from differential rates of change in per acre yields for different regions or abandonment of allotments.

The analysis of actual cotton planting in 1972 should provide considerable insight into the interregional adjustments in production that have not been allowed and the dependency of various regions of the U. S. on the government program. Also, conversely, the likely interregional adjustments that would occur with the cotton program termination should be indicated. This insight is available because the government programs in effect over this period did allow considerable latitude in individual farmer decisions regarding the number of acres of cotton to plant. The program in effect for the 1972 cotton crop required that cotton be planted on 90 percent of the base allotment to earn full government payments. There was no government imposed limitation on total planting except for the 20 percent set-aside requirement. By the time planting had begun for the 1972 crop, the market price had risen substantially above the support price, and forward contracting that allowed the cotton farmer to fix the sale price of his cotton before it was planted was a common practice.

Table 1 indicates the cotton price and payments that probably entered into cotton grower's decisions on how many acres of cotton to plant in 1972. The analysis of cotton planting relative to paying base allotment could be done using states to represent geographic regions. However, the use of the 20 regions used by the U.S.D.A. Cotton Cost Survey allows considerably greater homogeniety of production and market conditions within regions than is possible using state boundaries to define the regions. Figure 6 shows the 20 U.S.D.A. Cotton Cost Survey production regions.

PRODUCTION REGIONS FOR COTTON COST ANALYSIS

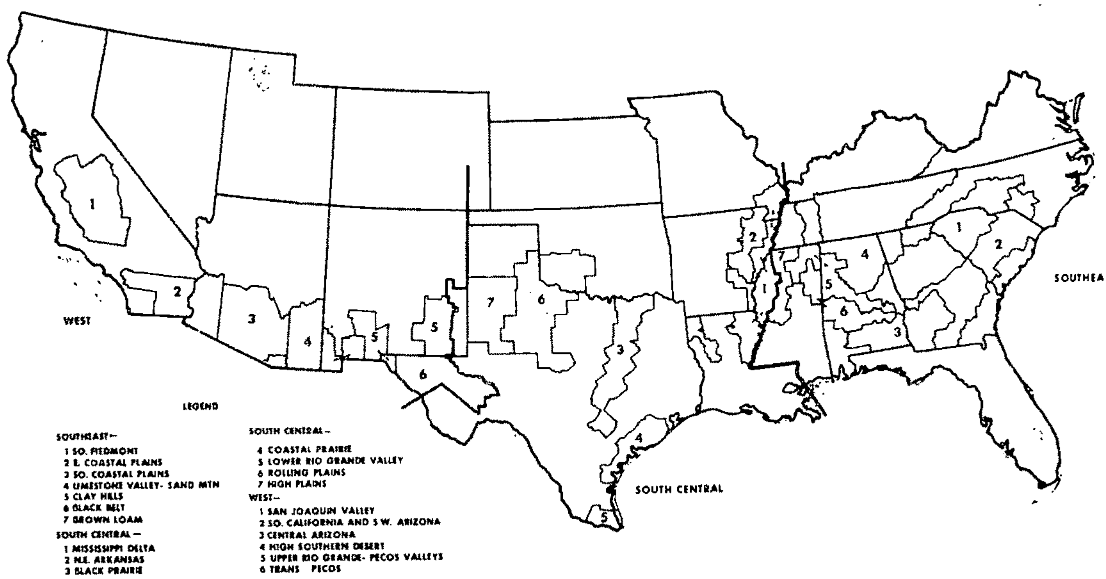

Figure 6. The 20 USDA cotton cost survey regions

Figure 7 shows the planting performance of the 20 regions in 1972. Four regions comprising nearly five million acres planted more than 150 percent of the region's paying base acreage. In this way these regions exhibited substantial independence of the government program. Six regions planted less than 110 percent of their respective total paying base acreages. Two of

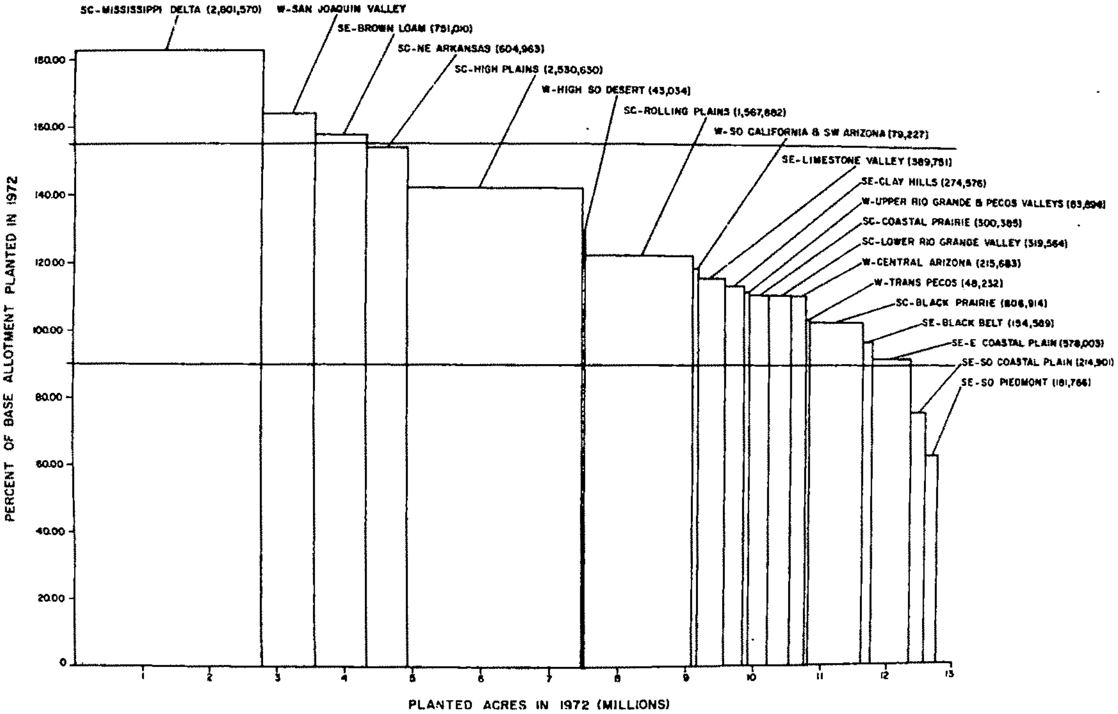

Figure 7. Percent of allotment planted and planted acres for 20 regions for 1972

these regions planted acreages totaling less than 90 percent of the paying base. Each of these six regions must have had substantial numbers of acreage allotment holders who found the prospect of 46 to 52 cents per pound insufficient inducement to devote their resources to cotton production. These regions are primarily located in the Southeast and appear highly dependent upon a continuation of government programs with features comparable to those of the past, including the restrictions on the transfer of cotton allotments across state lines.

Ten regions, comprising about 5.8 million acres of cotton, planted in the range of 150 to 110 percent of their base acreage allotments. Many farmers in these regions must have found a market price of 29 to 35 cents per pound for cotton sufficient incentive to plant cotton. For many this was a marginal decision, for planting beyond that production was well supported by the government payments on base allotments.

The study of cotton planting in 1972 in relation to the U. S. and non-U. S. markets as represented in Figure 5 indicated that prices well above those likely in a free-market situation are required to induce part of the U. S. cotton planting that has occurred in recent years. The 20 percent set-aside required for the 1971 and 1972 crops has to some degree counteracted the positive inducement to planting brought about by the price support payments on the base allotments for those crop years. In other words, the 1972 crop situation, in terms of total cotton production and market price, may not have differed substantially from the free-market level of those variables. But, the interregional adjustments emanating from the price support payments and the set-aside requirement have been additive in their distorting effects rather than canceling.

The analysis of cotton planting performance for the 1972 crop indicates strong comparative advantage of those production regions that are adjacent to the Mississippi River. Other areas that would seem likely to retain their past cotton acreages under free-market conditions would be the high plains and rolling plains areas of Texas, the western New Mexico area, and the production regions of Arizona and California, except the Central Arizona area.

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Agricultural Development Policies and Programs in Canada*

Darrel H. Plaunt

In any discussion of agricultural development policies, it is important to recognize that policies evolve out of processes that are essentially political, that politicians make the policy and that the role of economists and other public servants is to assist the politicians in clarifying issues, in proposing alternative courses of action, and in examining the consequences of these alternatives. It is also important to recognize that through these activities senior civil servants are often drawn directly into the process of policy analysis and program development. In this paper I would like to discuss ways and means of improving our understanding of the economic and social aspects of policy issues so that we can improve our future contribution to agricultural development policies and programs in Canada. Toward this end, we shall briefly examine approaches to Canadian agricultural policy, outline the evolution of the earlier agricultural development programs, describe the recently introduced Small Farm Development Program, and present a possible framework for future policy and program analysis.

Alternative Policy Approaches

Given the complexities of the income problems of Canadian agriculture and the issues involved, it is not surprising that a number of different approaches to Canadian agricultural policy have been employed. These include policies of income redistribution on the one hand and policies of marketing and market development and farm and rural development on the other.

The redistribution of incomes has been effected, both from consumers to producers, through the price system and from tax payers to producers through direct commodity subsidies. Such policies have traditionally been much less important in Canada than in some other countries. For the period 1968–1972, while British farmers have received perhaps 40–50 percent of their net incomes from redistribution, American farmers have received 20–25 percent and Canadian farmers perhaps 10–15 percent—nor is the level of redistribution likely to increase. The political and economic forces favoring redistribution of income as a major and permanent element of Canadian agricultural policy have weakened continuously over the past few years. Indeed, there is mounting evidence that the government will expect Canadian agriculture to become completely viable and self-sustaining, that is, without significant permanent income transfers, within the current generation.

One of the key elements of Canadian redistribution policy has been the efforts to shift supply functions to the left. These efforts have certain problems. In cases of elastic demand, they do not apply. In cases of inelastic demand, they cause some serious problems for the competitive position of Canadian farmers over the long run. To the extent that they succeed in raising incomes, these incomes accrue to the first owner of the rights; they are capitalized into the value of their assets; and their capital value is realized at time of liquidation. For second and subsequent owners, the capital cost of the rights become a permanent component of their cost structures, weakening their competitive position relative to foreign producers and reducing the growth potential of the industry.

The limited applicability supply control activities in an export oriented agriculture and the problems associated with it, together with continuing nonfarm pressures against direct subsidies, have placed a premium on finding other means of solving the income problems of the industry. These means are found within the development and adjustment potential of the Canadian agricultural sector in a growing world economy. They can be divided into marketing and market development on the one hand and farm and rural development on the other. The market development efforts involve ways and means of shifting the demand functions for Canadian agricultural products and of capturing those opportunities that already exist. Examination of these efforts do not fall within the scope of this paper. The other major thrust, farm and

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* The author is indebted to a number of his colleagues including G. I. Trant, W. V. Candler, W. T. Burns, W. D. Darcovich, J. K. McKenzie, T. C. Kerr, and D. McClatchy for helpful suggestions and criticisms. At the same time the author bears full responsibility for the opinions expressed. These opinions do not necessarily reflect the views of the Canada Department of Agriculture.

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rural development, will be outlined below. Let us begin by examining some of the earlier agricultural development programs and continue with a discussion of the newly introduced Small Farm Development Program.

Evolution of Earlier Agricultural Development Programs

The earliest agricultural development programs started with the establishment of the early land settlement patterns and remained largely unchanged, except for the development of the required infrastructure, until the introduction of organized agricultural research in the late 1800's and the organization of provincial extension services near the turn of the century. At the present time, even if the scope of the term "agricultural development programs" is limited to the farm and rural sectors, excluding the marketing of farm products and farm inputs, there is a wide variety of programs available. These include provincial research, teaching, and extension programs aimed at the farm and rural sector and engineering services, livestock improvement programs, credit programs, and farm diversification and enlargement programs, to name only a few. At the federal, or joint federal-provincial, level there are agriculturally oriented programs like PFRA (Prairie Farm Rehabilitation Act), MMRA (Maritime Marshland Rehabilitation Act), ARDA (Agricultural and Rural Development Act), and FRED (Funds for Rural Economic Development). In addition, there are general economic programs like the manpower programs and the industrial incentive programs which, though intended to stimulate economic development in a number of sectors, could be focused more directly on the particular needs of farm and rural people. Finally, there is the newly introduced Small Farm Development Program and the newly emerging programs under ARDA III.

Given such a variety of programs and given the involvement of three levels of government and several departments, it would be useful to attempt to develop a perspective of farm and rural development in Canada and an approach to its future development. Perhaps this is best achieved by assuming that many of the research, training, extension, and service functions in Canada are not too dissimiliar to those in the U. S. A. and by concentrating on those programs that are different. These include PFRA, MMRA, ARDA, FRED, and the Small Farm Development Program.

The Prairie Farm Rehabilitation Act

The Prairie Farm Rehabilitation Act of March 1935 was intended to deal with the disastrous conditions resulting from the combined effects of the Great Depression and a prolonged period of drought. "In the drought areas of the Prairie Provinces, the repeated crop failures wiped out not only the livelihood but also the entire working capital of resident farmers. . . . Successive crop failures affected an area of cropland, concentrated for the most part in Saskatchewan, equal to one-quarter of the total improved farm acreage in Canada. . . . . In 1931, one half; in 1933, 1934 and 1936, one-third; and in 1937, two-thirds of the farm population of Saskatchewan was destitute" [4, p. 120]. The resulting farm abandonment, fallow land, and continued drought lead to uncontrolled soil drifting and seemingly hopeless conditions for farmers who remained in the problem areas. Massive federal assistance was required. The emphasis was on "rehabilitation" in contrast to the relief payments of the previous six years. PFRA was conceived as a program of resource improvement to tackle the immediate problems of uncontrolled soil drifting and the longer run problems of developing resources.

Within a very few years, and for a relatively small direct investment ($9,000,000 up to 1945), the soil drifting problem was brought under control—in part by seeding and fencing abandoned land and converting it to permanent pasture and in part through an aggressive program of extension of improved cropping practices. While both were essential, the development and extension of improved methods by PFRA and the Dominion Experimental Farms, through the newly formed Agricultural Improvement Associations, enabled farmers to win the major portion of the battle against soil drifting. Improved practices were established on perhaps 50 percent of the farms in the Brown Soil Zones and up to 80 percent in the driest areas. . . . . "the added income from the salvaged land is incalculable" [2, p. 56].[1]

Another major aspect of PFRA was water development. Water development projects included farms, communities, and regions. They have been widely distributed across the three Prairie provinces. By 1965 they had produced

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[1] Frequent reference to Buckley and Tihanyi throughout the remainder of this discussion does not represent unqualified support for their conclusions but does reflect the absence of any similar study with which their results could be compared.

75,000 dugouts, with several thousand added each year, serving home, general farm purposes, rural communities, and supporting livestock enterprises. At the same time, a number of larger scale irrigation projects have been brought to fruition. Over its first thirty years PFRA had spent something in the order of $30,000,000 on community pastures, $100,000,000 on water development, and $170,000,000 on major irrigation projects.

Buckley and Tihanyi conclude that the early community pasture programs were highly effective in decreasing soil erosion and improving farming methods and that the gains were very large. At the same time, they conclude that the later programs of community pasture development (after soil drifting had been brought under control) and the programs of water development for farms and communities have produced incomes that have been widely distributed but relatively small. Also, the programs have increased cattle production, but this has not necessarily been a stabilizing influence on farm incomes. With respect to the major irrigation projects, Buckley and Tihanyi claim that the experience to date does not support original expectations in terms of increases in net farm incomes attributed to irrigation, the amount of land opened up to settlement, and the employment in secondary industry [2, p. 12]. Finally they argue, "A main conclusion which might be drawn from the PFRA experience would be the generally slight income improvements small farmers can anticipate from farm ponds, community pastures and similar programs centered on physical resources" [2, p. 14].

The Maritime Marshland Rehabilitation Act

Modelled after PFRA, the Maritime Marshland Rehabilitation Act of 1948 attempted to save Maritime marshlands from potential ruin due to years of neglect following the decline in the market for hay in the Eastern United States. It built 25 miles of dykes, 433 small dams, 4 major tidal dams and protected 81,000 acres at an aggregate expenditure of $21,000 or approximately $250 per acre. The program was jointly administered in the sense that the federal government took responsibility for the repair and construction and the provinces looked after drainage and land utilization. Again, according to the authors, there is little question of the technical achievements of the programs, and the nonagricultural benefits help to improve the overall benefit-cost ratio; but, ". . . it is the apparent failure to produce significant additions to farm income that is the main reason for concern" [2, p. 15].

Agricultural Rehabilitation and Development Act

Based on the experience of the resource oriented programs operated under PFRA and MMRA and a broader understanding of the problems of rural poverty, the Agricultural Rehabilitation and Development Act was passed in June 1961. Enabling legislation was subsequently enacted in each province. The first projects were launched late in 1963 and ran for about one and a half years prior to the expiration of the first agreement in March 1965. The second ARDA agreements under the name Agricultural and Rural Development Act covered the period to 1970. The third set of agreements are currently in operation.

The methods of operation under ARDA are in sharp contrast to those employed under PFRA and MMRA, where the federal government took the initiative and the provinces performed complementary functions. In the ARDA case, the primary responsibility for initiation and execution rests with the provinces. The federal-provincial agreements outlined a broad spectrum of programs and projects, and the provinces were free to make their choices within that range. The federal government offered a fund of $50,000,000 to be cost shared on a 50–50 basis. As a result, the success of ARDA depended largely upon provincial initiative and provincial ability to provide its share of the resources.

The scope and purposes of the ARDA program were also in sharp contrast with PFRA and MMRA. It was national, not regional. It concentrated on incomes more than on resources. The first agreements talked "of facilitating the economic adjustment of rural areas and of increasing the income and employment opportunities, and improving the standards of living of people in rural areas," of "improving the use and productivity of resources in rural areas," as well as the intention "to undertake investigation and research on [rural] needs and to provide financial assistance to the provinces on projects and programs" [2, pp. 93–94]. The following types were included: (1) Alternative Land Use—largely used to shift marginal or submarginal land into community pasture but also into forestry, wildlife, and recreation; (2) Soil and Water Conservation—aimed at good agricultural land and including drainage, flood control, stone removal, shelter belts, etc.; (3) Rural Development—concerned with stimulating comprehensive planning in rural development areas, active participation of local residents, and the provision of the services of rural development officers to assist with the development of ARDA-assisted development projects not necessarily restricted to agriculture; and (4) Research—including research sponsored by federal ARDA alone and federal contributions to provincial research on land use, land capability, market prospects, and a broad range of socioeconomic problems. Through the period of the first agreement approximately two thirds of the total allotment of $50,000,000 was committed, with approximately 70 percent of the committed funds going to alternative land use, 17 percent to research and 12 percent to rural development.

The second ARDA agreement implemented a number of important changes. The Land Use and Farm Adjustment section enabled ARDA to promote basic changes in the organizational structure of farming. ARDA could buy farms and woodlots valued at less than $100 per acre and regroup them into viable units for lease or sale to other farmers or for nonfarm uses. In addition, grants of up to $50 per acre were available for basic improvements to consolidate lands; loans were available for enlargement; and financial assistance was available for farm planning, management services, and forestry training. Under Soil and Water Conservation, the new emphasis was on resource management throughout an entire watershed. Finally, there was a general broadening of the scope of the agreements beyond agriculture to include other rural resources and to provide non-farm income and employment opportunities. In rural development areas of low income and insufficient employment opportunities, ARDA was to implement a variety of minor development projects—blueberry development, forest stand improvement, establishment of parks and recreation projects, fisheries development, etc.[2]

Based on the first three and a half years of ARDA operations, which were largely resource oriented and in which community pasture development was prominent, Buckley and Tihanyi conclude, "The land-resource-oriented investments, on which the regular ARDA program so heavily relies, appear to promise benefits in excess of costs more as the exception than the rule . . . . Offering certain minor kinds of assistance, but providing neither encouragement to leave nor the means to substantially improve scale and efficiency, ARDA farm programs are judged unlikely to have had any appreciable impact on the problems of low-income farming" [2, pp. 16–17].

Fund for Rural Economic Development

During the development of the second federal-provincial ARDA agreements, it was recognized that the amounts of resources were too small ($25,000,000 a year in the second agreements) and the terms of reference too limited to enable the ARDA program to deal in a comprehensive way with the problems of low income rural communities. As a result, the Fund for Rural Economic Development Act was passed July 11, 1966. It provided for $300,000,000 up to March 31, 1970. It authorized the federal government to undertake, jointly with the provinces, comprehensive rural development programs in Special Rural Development Areas. This broader approach seemed to be a direct outgrowth of the earlier ARDA experience. It included extensive research, the participation of local residents, and the development of comprehensive plans—all culminating in a broad range of major programs of federal and provincial agencies, financed partly from FRED funds. FRED plans have been launched in Prince Edward Island, two regions of New Brunswick, the lower St. Lawrence-Gaspé, and the Manitoba Interlake. The act was later rescinded by the act to establish the Department of Regional Economic Expansion, and the programs are continuing under that department.

Summary of earlier programs

Earlier farm and rural development programs, started with a focus on resource improvement under PFRA and MMRA, broadened to include farm adjustment under ARDA and expanded still further to include a comprehensive approach to rural development in especially disadvantaged rural areas under FRED. This gradual shift of emphasis away from agriculture and into the rural nonfarm areas left a very substantial gap in Canadian agricultural policy. It was, in part, to fill this gap for the small low-income farms that the Small Farm Development Program was proposed.

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[2] The third ARDA agreement, currently in operation, tended to carry these changes further away from agriculture and into the broader context of rural development programs.

The Recently Introduced Small Farm Development Program

The Small Farm Development Program (SFDP) represents a major emphasis of Canadian Agricultural Policy. At the same time it represents a change in the methods of financing such programs—a change from the cost-shared arrangements established under ARDA and FRED, to complete federal funding. It involves change from dependence on provincial initiative and implementation to federal initiative and joint implementation. Finally it represents one of the early applications of the systems approach to policy analysis.

During the past few years the term "systems approach" has been applied to a number of analytic procedures of varying degrees of sophistication and rigor. The importance of this particular application lies neither in its sophistication nor its rigor but in its success in facilitating the solution of a complex and highly interrelated set of problems. The procedure was as follows: (1) The first step was to identify the results required in terms of increases in incomes and the types of adjustments needed. (2) The next step was to identify the major groups of people and types of farms involved and the types of adjustments for each. (3) The third step was to identify the constraints or barriers to adjustment preventing typical families from achieving their desired goals. (4) The next step was to determine the number of families likely to be held back by each type of constraint, and how much better off they would be if that constraint were removed or if it could be overcome. (5) The fifth step was to rank the constraints in order of importance, where importance was measured both in terms of the numbers of people involved and the potential effects on the real incomes of those people. (6) The sixth step involved the elaboration of policies and programs to remove, or to help farm families overcome, some of the most important constraints. (7) The seventh step involved preparation of estimates of the costs associated with each program. (8) Finally, a small subset of the proposed programs were selected on the basis of the costs and expected benefits and presented to the politicians for their consideration.

While the foregoing procedure seems clear, simple, and straight forward, it is in fact both difficult and demanding. It would have derived significant benefits from better data and better models. It did, however, permit the systematic application of the judgment of a group of approximately 20 senior administrators and analysts from widely varying backgrounds, representing approximately 10 departments and agencies and having different responsibilities and divergent views on the problems of the agricultural sector. Its success depended in no small part on the provision of sufficient opportunity for constructive participation in the process of clarifying the problem, ranking the constraints, and examining alternative solutions. This participation ultimately led to joint decisions on the appropriate courses of action.

The general purpose of the program is to enable the owners of small uneconomic farm units to attain equality of social and economic opportunity with other Canadians.[3] More specifically, it is to enable the owners of small uneconomic farms to improve their incomes, security, and satisfactions to the levels enjoyed by owners of similar resources in other industries. It involves three separate but interrelated sets of programs: the land transfer program, information and consulting services, and planning and coordinating services.

The land transfer plan

The land transfer plan is designed to facilitate the transfer of land by providing special credit for prospective purchasers of small farms, assistance grants for prospective vendors of small farms, a listing service to bring buyers and sellers together, and, under special circumstances, facility for outright purchase and resale. The special credit provisions of the program are to enable the owners of small but potentially viable farms to take advantage of opportunities for farm consolidation and enlargement. The eligible purchaser may buy a farm on agreement of sale, with a very low down payment ($200 on any farm up to $20,000) without mortgaging the farm he already owns as security for the balance of the purchase price, with payments spread over a period of up to twenty-six years and at the same interest rates as regular FCC mortgages.[4] Priority is given to owners of small farms. Owners of larger farms are encouraged to take advantage of regular FCC credit.

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[3] More detailed treatment of the program will be available in the forthcoming issue of *Canadian Farm Economics*.

[4] The Farm Credit Corporation (FCC) is a crown corporation established to provide mortgage credit to Canadian farmers. It operates the Land Transfer Plan as part of the Small Farm Development Program.

Assistance grants are made available to owner-operators of small farms. The assistance grants are used in combination with the equity realized from the sale of their farm assets to help them take advantage of retraining, employment, or other opportunities in the local community or region. The assistance takes the form of a once in a lifetime grant of $1,500 plus 10 percent of the sale price of the farm, the total amount not to exceed $3,500. The grant may be paid as a lump sum, or in the form of an annuity. The listing service is to facilitate communication between buyers and sellers. Emphasis is given to the availability of land for purposes of farm consolidation and enlargement.

Under the normal operations of the program, transactions take place between individuals. The FCC does not take title to the land except for immediate resale under agreement of sales. Under special circumstances, however, the FCC has authority to purchase and hold title to farms for which there is no immediate prospect of resale. These include conditions where the farms meet the eligibility criteria; the land is suitable for agriculture; and the owner has to move in order to take advantage of suitable alternative employment or the owner wishes to retire and it would be a severe hardship because of ill health or inadequate income to wait until a private purchaser can be found.

Information and consulting services

The information and consulting services provide the assistance required to help farmers clearly understand the alternatives available to them and the consequences of alternative courses of action. The program includes a Rural Development Service, a Farm Management Service, and a Farm and Rural Management Information System. The primary function of the Rural Development Service is to provide rural development officers to work with farm families; to help them find ways and means of increasing their incomes, security, and satisfactions; to help them identify and clarify their opportunities; and to help them analyze and evaluate their alternatives. Once this is accomplished, the farmer and his family should be able to make the basic decision to develop within agriculture or to take advantage of nonfarm opportunities. If they decide to develop within agriculture, they can call on the assistance of the farm management specialist. If they decide to take advantage of nonfarm opportunities, the rural development officer will continue to provide assistance through the adjustment period.

The main function of the Farm Management Service is to supply farm management consulting services to the owners of small, but potentially viable, farms who have made the basic decision to develop within agriculture. They work on a one to one basis with farmers and farm families. Their main job is to assist developing farmers through the development period. The Farm and Rural Management Information Systems are intended to provide the data and information required by farm management consultants, rural development officers, and their colleagues in federal and provincial governments in dealing with the farmers participating in the Small Farm Development Program.

Planning and coordinating services

The institutional arrangements required for the implementation of the SFDP involve the development of federal-provincial agreements, the operation of a federal-provincial policy committee at the national level, the operation of an interdepartmental committee within the federal service, and the provision of the research and secretariat services required to enable these institutional arrangements to operate effectively. It is hoped that these arrangements will provide a foundation for joint federal and provincial policy and program development and operation, not only with respect to the further development and operation of the SFDP but also with respect to other policies and programs in farm and rural development.

A Possible Framework for Further Policy Analysis

Given the evolution of the earlier farm and rural development programs, the description of the newly introduced Small Farm Development Program, and the planning and coordinating Services available for further policy analysis and program development, it becomes important to attempt to outline a method of operation for improved policy analysis and program development in order to solve the wider problems of the farm and rural sector.

A method of operation

One method of operation that seems to be gaining credence in Canada involves joint policy analysis and program development, including the two senior levels of government, and sometimes, but not always, full participation of farm organizations, agribusinesses, and local communities. This method seems particularly appropriate to issues in farm and rural development, where the problems are so deeply rooted and the investments so large that neither federal nor provincial departments of agriculture are likely, by themselves, to compete successfully with other sectors of society for the scarce resources required to make such large investments. It is expected, however, that through their joint efforts, they could compete successfully for larger amounts of Canada's economic development dollars. Such joint efforts would require joint planning, joint policy and program analysis, and jointly supported approaches to their respective levels of government. Such joint planning requires not only the institutional arrangements already outlined under SFDP but also the development and utilization of an adequate framework of analysis. Such a framework of analysis would also have to be jointly developed and jointly understood before much progress could be made. It is toward this understanding that the following outlines are presented. It is hoped that they will form a basis for further discussion and subsequent development of the methods, the tools, and the data required for joint policy analysis and program development. Three elements are presented for discussion: a view of the process of policy analysis, a view of the goals involved, and a view of the systems issues and the models required for improved policy analysis and program development.

A view of the process of policy analysis

Starting from the steps enumerated earlier, it would seem useful to proceed on a more general level to investigate the wider set of problems involved. (1) The first step is to identify the goals of the Canadian society for the economy, for the agricultural and food system, and for related sectors. (2) A next step involves description of the agricultural and food system and its interrelationships with other sectors of the economy and with international markets. (3) A third step involves identification of the issues. Given the goals or concepts of "what ought to be" and the description or concepts of "what the situation is," it becomes possible to recognize some of the economic and social issues before they reach the political level. (4) Another step involves conceptualizing the relevant systems and subsystems in terms which help to clarify the issues, explain the relationships, and suggest appropriate policy instruments. (5) A subsequent step involves the preparation of models which can be used to help explain or predict the performance of the relevant systems and subsystems, and to determine the changes required to achieve certain goals. This includes the construction of the models, the development or use of appropriate sources of data, validation of the models, and the identification of the specific linkages between models and between sets of models. (6) The next step involves the use of the models for testing the consequences of changing selected variables. This should facilitate identification of both the "goods" and "bads" resulting from changes in the system. (7) Another involves the design of policy instruments which are capable of influencing selected "goal" variables in the desired way. This activity, in conjunction with the foregoing activity, should permit the identification of the "costs" and the "benefits," i.e., net benefits both quantitative and qualitative, likely to accrue from the use of the instrument in question, either singly or in combination with other instruments.

Given these estimates of benefits, it should be possible to reduce the range of alternative proposals to the point where they can be presented for political consideration. Given the highly interactive nature of these so-called "steps," it becomes important to view the process of policy and program analysis as a continuum of interacting loops, each involving clarification of previous activities before completion of subsequent activities. In addition, given the critical importance of the goals of society, it becomes important to examine briefly some of these goals before proceeding to an investigation of the systems, issues, and models that help to clarify these goals and interrelationships and the policy instruments required.

A view of the goals involved

One important set of goals are those enumerated by the Economic Council of Canada for the economy as a whole [3, p. 1]. These include full employment, a high rate of economic growth, reasonable stability of prices, a viable balance of payments, and an equitable distribution of rising incomes. A more recent statement would likely include concern for the quality of the environment. Within this set, there are a number of more specific goals for the agricultural and food system. These include the production and distribution of a large and continuous supply of high quality foods and fibres, as well as concern for agriculture's contribution to each of the goals listed above. In addition, the agricultural and food system has some special contributions to make to the development of a socially and economically viable rural sector and to ways and means by which larger numbers of Canadians can participate in this development—solving some problems not only for the rural sector but also for other sectors as well. Finally, there are more specific goals with respect to the size of the incomes stream, its distribution and its stability over time. It follows, from this view of goals, that there are a large number of stakeholders involved: consumers and taxpayers, producers of inputs and purchasers of products, as well as farmers, rural residents, and the community at large. It also follows that it is necessary to develop the facility to examine the impacts of alternative policy instruments on all of the groups involved, in order to facilitate government decisions with respect to the trade-offs or compromises required. The clarification and further specification of goals is highly interactive with the process of describing the systems and subsystems, and modeling the interrelationships involved.

A view of the systems and issues involved, and models required

If these are the goals, then one useful view of Canadian agricultural policy starts with a world trade perspective, an understanding of the unique features of the structure of the economy as a whole, and a view of the roles of the agricultural sector within this environment. Such a view enables us to visualize the sector as a large "agricultural and food system" with a major portion of its marketing systems for agricultural products operating in the industrial and service sectors; its production systems operating largely in the rural sector; and its markets for manufactured inputs operating in the industrial, service, and rural sectors.

Since the production components of such a system constitute a relatively large proportion of the rural sector and the marketing components for agricultural products a relatively small proportion of the industrial and service sectors, it would seem advisable to treat the agricultural and rural sectors as a single agricultural and rural system or, more accurately, as two highly interdependent sets of systems. One of these systems, representing the rural nonfarm sector, provides markets for farm products and farm resources and supplies nonfarm inputs—transportation, communication, power, housing, recreation, health and educational services, for example. All of these have important implications for the real incomes and the quality of life for farm people. In addition, in some regions the nonfarm sectors provide opportunities for off-farm income through tourism, forestry, fishing, etc., as well as through its service functions to the farm sector.

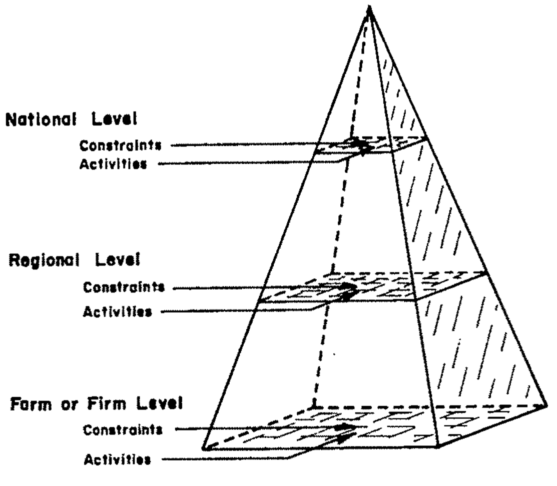
In the other system, representing the agricultural and food sector, important commodity issues tend to arise at different stages in the production and marketing systems. In rapeseed production and marketing in 1970, for example, there were important issues in the production stage associated with the change to low erucic acid varieties. At the same time, there were issues in the marketing stage involved in getting the product through the transportation and storage network and into export position at major seaports.

Other issues tend to concern a number of commodities at the same stage in the production and marketing processes. For example the Grassland Incentive Program tends to shift land from grains into forage and hence into beef production. It seems to follow from similar examples that any overall view of the agriculture and food system must have the facility to trace the problems of a single commodity throughout its entire production and marketing system, and, at the same time, to trace the impacts across all commodities at any one or more of the stages in their production and marketing systems.

On a more general level, it becomes apparent that agricultural policy issues may arise in any or all commodities and at any or all stages from the purchase of manufactured inputs to the point of final sale of processed products. In addition, there is a high degree of interaction among all parts of the agricultural and food system and between the system and all other sectors. Hence, for many policy issues—whether they involve farm and rural development, market development, or both; whether they are within a commodity or cut across all commodities; whether they are within the agricultural and food sector or cut across several sectors—it would be extremely useful, where possible, to be able to trace the interactions through the system as a whole. This implies the need to be able to model the economic and social relationships involved. It also requires an appreciation for what can, and what can not, be done with models. This lies somewhere between the view that models are simply interesting pedagogical devices, and the view that May Boradbeck criticizes when she comments on those who imply, "Models are Good Things." And . . . "mathematical models, needless to say, are even better" [1, p. 373]. The view expressed here is that models can be developed as useful tools to facilitate understanding of the relationships involved and to provide useful insights into the consequences of alternative policy proposals, but that they must be developed and interpreted with great care and good judgement.

One useful approach to model building, to handle the varieties of issues considered here, is to start with a framework that is global, but construction that is partial. It would be nice to start with a large national model, but that is neither necessary nor practical. It is useful, however, to start with the conceptualization of one large model, at a fairly high level of aggregation, and use these concepts in helping to think through the overall systems and subsystems and the interrelationships involved. These interrelationships pervade not only the national level but the regional and individual firm and farm levels as well. Perhaps a pyramid provides a simple and convenient way of visualizing some of the dimensions involved. It is possible to think of three horizontal plans through a pyramid, one at the base representing models of individual farms and firms, one part way up representing regional models, and one near the top representing the national model.

PYRAMID OF MODELS



Suppose the national model were of the mathematical programming type where columns contained "activities," or sets of activities, representing products ranging all the way from beef, to dairy products, to feed grains, to fruits and vegetables, to forest products, to tourist services. The rows would contain constraints, or sets of constraints, on the marketing of inputs and the production and marketing of products. Out of such a matrix one could access part or all of the dairy system, for example, and develop a dairy model in any degree of sophistication required for the policy issue at hand and be reasonably certain that it could be integrated back into the overall model to trace the broader interrelationships involved. One would also hope to be able to trace impacts of proposed changes in dairy policy not only on other commodity systems at the national level but also on each region through the regional models, and at the micro level through farm and firm models. The same logic would apply for any other type of agricultural commodity or product of the nonfarm rural sector. In the same way, it would be desirable to analyze changes in the demand for agricultural products, and hence the product mix, and to trace their impacts on regions and on types of farms. Finally, the impacts of farm and rural development policies could be analyzed for their effects on farms, on regions, and on the agricultural and rural system as a whole.

Desirable as such capability would be, there are some important economic questions to be raised concerning the allocation of our scarce analytical capability. Included in the questions are: Which issues are most important? Which analytical tools and which sources of data should be developed first? How can an overall framework be established to help ensure that each model can be compacted or added into the overall model, or linked with other models, to ensure that in combination they make their maximum contribution to the overall set of policy issues for the agricultural and rural sectors?

A number of alternatives come to mind. One is to start with a set of sector models for major commodities or groups of commodities, tracing the interrelationships from the marketing of purchased inputs to the sale of final products. The production components of these models could be based on micro models designed to predict the behavior of types of farms, probably constructed largely out of CANFARM type data and weighted with a master sample of

CANFARM type records.[5] These could be aggregated to the regional level and ultimately to the national level. Similar models of typical firms might play similar roles in other stages of the production and marketing systems for agricultural and nonagricultural products of the agricultural and rural sectors. Another alternative is to operate essentially without the help of these types of models, as in the case of the development of PFRA, MMRA, ARDA, and the Small Farm Development Program, and attempt to do the required cost-benefit analysis on a much less formal and structured basis. A third set of alternatives lies somewhere between these two extremes.

It is clear that, at the present time, the policy instruments available in farm and rural development are still relatively blunt and that significant gains in farm and rural incomes and levels of living could be made with relatively simple policies and programs. At the same time it is also clear that, in the future, further gains in incomes will be more difficult to make. They will require finer tuning of the system, more refined policy instruments, and much more sophisticated sets of models. It would seem to follow that a significant proportion of our analytical ability should be brought to bear on the systematic development and integration of the types of models required for future policy analysis and program development.

The policy analysis and program development activities of the farm and rural sectors require the joint efforts of the two senior levels of government and the support of farm organizations, agricultural and rural businesses, and the rural communities. Such efforts require an institutional framework in which to operate and a conceptual framework with which to analyze policy issues. The institutional framework for farm and rural development is already in place. The conceptual framework has not been thoroughly discussed. It is hoped that the foregoing discussion of the process of policy analysis, the goals, and the systems issues and models will precipitate discussion and a useful point of departure for the development of an adequate framework of analysis for farm and rural development policies and programs, both now and in the future.

Summary

This paper traces the evolution of farm and rural development policies in Canada from the heavily resource oriented programs of the 1930's to the 1950's, to the farm adjustment and rural development oriented programs of the 1960's, and to the newly introduced, income oriented, Small Farm Development Program for the 1970's. It outlines the institutional framework available for joint policy analysis and program development and attempts to suggest the outlines of possible analytical approaches for the joint efforts of both levels of government, both now and in the future.

If appropriate analytical procedures are jointly developed and jointly employed, then a more effective and more fully integrated set of policies and programs could be jointly devised. They could be supported by both levels of government, and they would have major impacts on the growth and development of the farm and rural sectors and on the welfare of farm and rural people.

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[5] CANFARM stands for Canadian Farm Management Data System—a national farm records, farm business analysis, data retrieval, and farm planning system.

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Farm Income and Labour Mobility*

BRIAN B. PERKINS

THROUGHOUT the postwar years the problem of low resource returns or, in the more popular terminology, the farm problem has been a central theme among agricultural economists. Successive writers have presented new hypotheses or elaborated earlier ones as events or arguments have demonstrated the inadequacies of previous explanations. However, while convictions on this issue abound, the basis for consensus has receded with the increasing complexity of the issues. Indeed, Professor Tweeten [10], a recent and major contributor to this *cause célèbre,* expresses some agnosticism about the relative merits of the "theories advanced to explain persistent low returns in agriculture," and even discusses the possibility that the problem is a figment of the imagination of agricultural economists.[1]

In view of the significance of conclusions on this issue for hypotheses on farm income and labour mobility, and hence for the design of research programs and for the development of agricultural policies, thorough examination of the low returns problem is not merely necessary but crucial. In the first half of this paper the resource returns problem is discussed in a general context; in the second, attention is focused on the situation and prospects regarding incomes and employment in Canadian agriculture.

I do not propose to discuss the "naive" thesis that agricultural output expands rapidly as a result of technological change, that given low demand elasticities for farm products, farm product prices and resource earnings are driven down, and that farmers respond by adopting more output increasing technology. While this thesis still has currency among laymen and with some professionals, its weaknesses have been dealt with admirably by Hathaway and by Tweeten [6, 10]. In much of my discussion I draw heavily on Tweeten's contributions. I make no apology for this since, to my mind, his article is by far the most rigorous and comprehensive examination of the low returns issue.

The Resource Returns Problem

Tweeten identifies three major sources of farm resource disequilibrium: the declining capital/labour price ratio associated with economic growth and determined essentially outside the agricultural sector; the inability of farm operators, because of the structure of farming, to pass on input cost increases; and output increasing changes in agricultural technology. The question, as he succinctly puts it, is why resources do not adjust fast enough to ensure that earnings in agriculture are equal to their nonfarm opportunity costs.

In examining the fixed asset thesis of low resource returns, developed earlier by Glenn Johnson and by Dale Hathaway, Tweeten dismisses the explanation for each category of resources other than labour on the grounds that the evidence shows resource earnings at or above opportunity costs, e.g., durable capital, or because the life of the input is short enough for adjustments to be made readily, e.g., operating capital, or, in the peculiar case of land, because its value is determined primarily within agriculture. With respect to labour, Tweeten argues that from an initial situation where the MVP of labour in agriculture and in nonagricultural uses are equal, the MVP in agriculture could fall considerably without any resultant movement out of the sector. The fall could occur because the age, education, and nonfarm skills of farm workers put them at a disadvantage in nonfarm job markets, because of transfer costs, and because of psychic benefits in farm employment. Unfortunately, these considerations show why the opportunity costs of farm labour may be lower than their earnings in agriculture—quite the obverse of the problem Tweeten set out to explain.

In general, it may be noted that the asset fixity concept, as applied by Johnson and Hathaway to account for disequilibrium in agriculture, is static, does not take account of technical change or changing preferences, can only cumbersomely be adapted to consideration of changing factor and product prices, and then fails to show why asset fixity will give rise to low resource

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* The views expressed in this paper are entirely those of the author and are not necessarily those of Agriculture Canada.

[1] For some earlier contributions on the low returns see [2, 6, 7, 8, 9].

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returns as a persistent characteristic of the agricultural industry. The concept of asset fixity is applicable to the allocation of resources by the owner of those resources. In the case of labour it is the individual worker who owns his resources, and it is difficult to see the rationale for postulating that he faces distinct "acquisition," "value in use," and "salvage" prices. Tweeten's attempts to apply the concept at the industry level are heroic but unsuccessful. An alternative is to construe asset fixity for the industry as referring to the net effect of the expectations and behaviour of all entrepreneurs in the industry. This approach would lead to the familiar proposition that a particular resource is fixed in agriculture if there is no tendency for the quantity of that resource in the sector either to increase or decline, on a net basis. In fact, the movement of labour out of agriculture—through the decline in numbers employed, through reduced working hours, and through the rising incidence of multiple job-holding—has been very high. This observation brings us back to the question: why has it not been more rapid?

The second general explanation of agricultural disequilibrium examined by Tweeten rests on imperfections in factor and product markets. As he shows, however, imperfect competition in these markets cannot account for low rates of return in agriculture if farm resources are mobile. Imperfections in the labour market, through union activity, discrimination, minimum wage legislation, lack of knowledge, and the attendant problems of unemployment and job insecurity, can discourage and impede the movement of labour out of agriculture. Tweeten concludes, however, that only in the case of labour markets can imperfect competition be adduced as a significant source of low returns in agriculture. This thesis therefore reduces to, at best, a very partial explanation of agricultural disequilibrium.

Quite different is the increasing returns to size, or decreasing cost, thesis. This argument, which has been developed primarily by Tweeten, far from treating the agricultural sector as if it were one large firm, asserts that given that average costs decline with increasing farm business size, the distribution of farms by economic class is the basis of low returns to the majority of small and medium sized farms. That is, opportunity cost returns on resources are achieved by larger farms through "labour-saving technology, economies of buying and selling . . . and indivisibilities," which favour larger units, and the majority of smaller farm operators fail to adjust rapidly enough through mobility out of agriculture because of imperfect knowledge, inadequate education for off-farm work, nonfarm unemployment, and a preference for farming as a way of life. Moreover, the process of adjustment bids up the price of land, since land tends to be complementary with other production factors, and the anticipated gains in efficiency through consolidation tend to be capitalized into land values. Hence, the opportunity costs of land rise even to those smaller farm operators who do not sell out, making their operations in this sense still less economic. The redundancy of much of the labour force in agriculture is evident in the possibility of reorganizing the structure of farming so as to achieve the same level or higher levels of output with fewer labour resources on a much smaller number of large, efficient farms. In fact, Tweeten estimated that as of 1960 some 90 percent of U. S. farms were subeconomic units, in the sense of failing to achieve opportunity cost earnings on resources. As a result, a persistent problem of low resource returns in agriculture can be anticipated.

It is, of course, precisely this sort of reasoning which endears us, as agricultural economists, to rurally-based politicians. Ironically, it is the increasing returns to size thesis which most strongly supports the low returns diagnosis and which implies the least palatable solutions for those who represent agriculture. However, the relevant issue for this forum is whether this analysis of the farm problem is correct.

Patently the evidence for decreasing costs in agriculture is strong. The thesis recognizes much of the structural differences within agriculture. It is consistent with the observed growth of farm firms, with the viability of larger commercial farm enterprises, with the concentration of outmovement of labour from the smaller output farms, and with the capital gains generated by agricultural demand for land. One can question Tweeten's use of a uniform cost of labour across economic classes of farms and at levels which were generally higher than the actual wage rates of hired labour. One can question the omission of management as a factor of production. It can be argued that if structural adjustment bids up the price of land, this situation should favour the mobility of small scale operators out of agriculture through capital gains. But, the fundamental criticism is with respect to the redundancy of labour conclusion on which Tweeten rests his case for disequilibrium in agriculture. That conclusion is based on manufacturing wage rate opportunity costs, which are not those facing individuals who lack off-farm skills and work experience, face job insecurity and the loss of farm living benefits.[2] It neglects the full social costs of so massive a reallocation of resources. In brief, it does not distinguish between the problem of low resource returns in agriculture and the problem of low incomes due to the resource distribution, including under that rubric the quality of the human agent.

Tweeten effectively hedges his bets by considering the possibility that the "low returns" problem is the result of economists imputing too high an opportunity cost for labour, and he conscientiously points to some studies which show that farm-nonfarm earning differentials are consistent with schooling differentials, that rates of resource adjustment in agriculture are relatively rapid, and that the gross movement out of and into agriculture is high. But perhaps understandably, he is reluctant to draw the inference that the actual earnings of resources in much of agriculture, particularly of labour resources, reflect the nonfarm opportunity costs of those resources.

I would suggest that we need to examine the relation of human resource earnings in agriculture to their nonfarm opportunity costs from two perspectives.[3] The first is the usual comparison of extant earnings in farming with extant earnings in relevant alternative occupations. The second is the relation between the earnings *expected* by farm workers in farm and in nonfarm occupations. The difference in concept, and the underlying conceptual problem to which my suggestion is addressed, is analogous to the issue of the extended debate, following publication of Keynes' General Theory, about the equality of saving and investment, and of the ex-ante differences between the magnitudes of the two variables. Ex-post, when all the factors which determine the individual's earnings in farming and his off-farm opportunity cost earnings in a particular period are taken into account, the differences may not reveal a major problem of low returns to farm labour. To put it more bluntly, the problem viewed in this perspective may result from the imputation by economists of excessively high opportunity costs for farm labour. The ex-ante perspective starts from the observation that job and career decisions are based on expectations about earnings in different occupations and on preferences for certain kinds of work. If subsequently the individual realizes that his original expectations were mistaken, or finds that his preferences have altered in such a way that he wishes to change to some other employment, he may find that his existing opportunity costs do not make it worthwhile for him to leave. Concretely, in the case of a forty year old farm operator who realizes that if he had entered some nonfarm occupation 20 years before, he now would be earning twice as much as in farming and working much shorter hours, he may well find his current prospective earnings in nonfarm work insufficient to induce him to move.

Mistaken career decisions are not peculiar to farmers and other farm workers, but the incidence appears to have been higher and the consequences more serious than for workers in most other occupations. Several factors appear to contribute to this situation. Assessments of nonfarm employment opportunities have probably underestimated considerably the growth of earnings, the improvement in fringe benefits and of social security benefits. One would hypothesize, however, that such underestimation of opportunities outside agriculture is declining in importance with the continuing growth of the North American economies and with the closer integration of rural and urban society through the influence of the media and formal education. Expectations regarding the capital, and especially the managerial requirements, for farm business growth to achieve income aspirations likely have been underestimated, also; certainly the educational levels and experience of the majority of farmers have not helped them to make such assessments. Changing preferences of farm families, resulting from social integration, have caused them to aspire increasingly to the consumption and leisure standards of urban society, in direct conflict with the traditional aims of full farm ownership and with the related premises on which existing credit policies are based. In short, I am suggesting that the expectations of individuals with regard to the opportunities in farming may not have been collectively realizable, that farm families have tended to underestimate nonfarm opportunities, that dissatisfaction about their situation has been augmented by a shift in preferences toward urban living standards, and that the reversability of decisions to work in agriculture is inversely related to the number of years the individual has been farming.

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[2] It neglects also the effect of anticipated capital gains on resource allocation and mobility decisions.

[3] To the extent that my suggestion has any vestige of merit, recognition for originality should be given to Dale Hathaway; I have merely tried to develop an idea expressed by him in a private conversation.

The very decline in employment in agriculture is evidence of low returns to farm labour at the margin. But clearly this is not characteristic of farming as a whole—nor yet of smaller scale farms in general—inasmuch as part-time farming and multiple jobholding is providing a significant compromise between the higher earnings of off-farm employment and the attractions of farm life and work for a large proportion of the small scale majority of farm operators. The persistent low money earnings of a high proportion of farm families is not so much testimony of the shortcomings of the labour market as it is evidence of mistaken career decisions, of the meagre resources with which they started farming, and of the continuing preference for farm life. Certainly, imperfections in labour markets, and in particular high rates of unemployment, exacerbate the adjustment problems and add to the human costs of the adjustment process, but they do not account for its long run persistence. Regrettably, the magnitude of the present adjustment problem, its dynamic nature, and the lagged effects of preferences and employment decisions promise to make this a continuing issue.

Prospects for Income and Employment

To put some flesh on these arguments, I propose to examine the prospects for income and labour mobility in Canadian agriculture, and to identify some major implications for research. First, by way of background, a thumbnail sketch of the situation respecting farm employment and incomes in Canada is relevant.

The structure of farming in Canada, in terms of the distribution by economic class, is characterized by a large proportion of relatively small farm operations (Table 1). Of the total of 365,000 noninstitutional farms identified in the 1971 Census, over 90 percent had sales of less than $25,000 and nearly 70 percent had sales of less than $10,000.[4] Moreover, these percentages are even higher in the Atlantic provinces, Quebec, and, to a lesser extent, Manitoba. In view of this economic structure, it should not be surprising that a high proportion of Canadian farmers work off their farms for at least part of the year. More than one farmer in three in the 1971 Census reported having had off-farm employment in the preceding year and more than one in five reported in excess of 96 days of off-farm work, notwithstanding a national unemployment rate of about 6 percent. The increasing importance of multiple jobholding among farmers is evident both in the incidence of off-farm work and in the number of days of such employment (Table 2).

Estimates of employment in Canadian agriculture by class of worker are provided in Table

Table 1. Distribution of farms by economic class and province, Canada, 1971[a]

	All Farms	Under $10,000	$12,000-24,999	$25,000 and Over
	(percent of national total)			
Atlantic provinces	4.7	3.7	0.6	0.4
Quebec	16.7	12.5	3.3	0.9
Ontario	25.9	16.1	5.9	3.9
Manitoba	9.6	7.0	2.0	0.6
Saskatchewan	21.0	14.8	5.2	1.0
Alberta	17.1	11.1	4.2	1.8
British Columbia	5.0	3.8	0.6	0.6
Canada	100.0	69.0	21.8	9.2

[a] Distribution excludes institutional farms and farms in Yukon, Northwest Territories.

Source: Census of Canada, Agriculture, 1971.

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[4] It should, of course, be recognized that many units are farms only according to the Census definition of a holding of one acre or more with at least $50 of sales of agricultural products; for example, 7 percent of the 1971 Census farms had sales between $50 and $250. Moreover, it can be argued that abnormally low sales by wheat farmers in that year distorted the distribution by economic class. Nevertheless, the basic point that most Canadian farms are relatively small businesses holds.

Table 2. The incidence of off-farm work among farmers by economic class of farm, Canada, 1951, 1961, and 1971

		Economic Class of Farm		
	All Farmers	Under $10,000	$10,000-24,999	$25,000 and Over
Percent reporting off-farm work				
1971	35.3	42.0	22.1	17.3
1961	32.0	34.0	14.2	11.8
1951	27.6	n.a.	n.a.	n.a.
Days off-farm work per farmer reporting such work				
1971	154	167	99	94
1961	147	149	103	128
1951	124	n.a.	n.a.	n.a.

Source: Census of Canada, Agriculture, 1951, 1961, 1971.

3. These data are derived from the monthly Labour Force Survey, and inasmuch as the classification by occupation and class of worker are based on the respondent's major employment in the reference week, the estimates approximate to man-year equivalents. The employment of farm operators has halved since the early fifties, due both to off-farm mobility and increased multiple jobholding. The decline in employment of unpaid family workers has been equally dramatic, but most of the reduction in this category occurred in the fifties; nearly all the decline in this class has been of male workers [1]. Quite different, and in sharp contrast to experience in the United States, is the lack of significant trend in the employment of hired workers, reflecting the offsetting effect of the commercialization of the sector over the general substitution of capital for labour. The decline in total employment in Canadian agriculture moderated from an annual rate of 3.4 percent in the decade 1950–52 to 1960–62, to 2.9 percent in the succeeding decade.

Table 3. Employment in agriculture by class of worker and as a proportion total employment, Canada 1950–52, 1960–62, and 1970–72

	1950–52	1960–62	1970–72
Class of Worker (000's)			
Farm Operators	594	430	287
Unpaid Family Workers	248	133	115
Paid Workers	107	111	100
All classes	949	674	502
Percent of total employment	18.7	11.1	6.2

Source: *The Labour Force,* Statistics Canada, various issues.

Until recently the paucity of data on the incomes of farmers and farm families has been conspicuously, and indeed shamefully, poor, particularly in relation to the importance of income issues in the development of agricultural policies. Now we are about to be confronted by a veritable embarrassment of riches with the advent of at least four new sources of data.[5] Clearly, the development of farm income data and its analysis is made difficult by the complexity of employment patterns, the importance of nonmonetary forms of income, and the number of joint decisions within the farm family respecting investment, employment, and consumption.

Estimates of 1969 average money income and of income distribution in terms of the Gini ratio, are provided for Canadian farm, rural nonfarm, and urban families in Table 4. These estimates indicate, as might be expected, that the average levels of money incomes of farm families are only slightly less than those of other rural families but are substantially below the income levels of urban families, and that these differences are even greater when family size is taken into account. Similarly, the Gini ratios show a greater inequality of income distribution among farm families than among urban families, although

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[5] I refer to the Agricultural Enumerative Survey, the income tax returns data (both being developed by the Agricultural Division, Statistics Canada), the biennial income distribution survey (Consumer Income and Expenditure Division, Statistics Canada), and the Agriculture-Population Linkage Project of the 1971 Census.

Table 4. Estimates of money incomes and income distributions of farm, rural nonfarm, and urban families and unattached individuals, Canada, 1969

	Estimated No. of Families '000	Money Income Per Family ($)	Gini Ratio	Money Income Per Person ($)
Farm	359	5785	.373	1377
Rural Nonfarm	713	6074	.352	1642
Urban	4783	8488	.336	2738
Total	5853	8028	.346	2433

Source: Economics Branch, Agriculture Canada, unpublished estimates based on the 1969 Family Expenditure Survey (Consumer Income and Expenditure Division, Statistics Canada).

students of income distributions in the United States will note that the degree of inequality among farm families and the differences among urbanization classes are less than those evident in comparable United States data. While the data source of these estimates permitted income in kind and net change in equity to be included only partially, it is worth noting that the addition of these forms of income improved the income levels of farm families relative to nonfarm families, and appeared to eliminate the noted differences in the equality of income distribution.

In Table 5 the distribution of the money income of farm families between farm and off-farm sources is shown for each money income class. These estimates indicate the importance of off-farm income sources in all income classes and the predominance of off-farm income in the total money income of farm families as a whole. The same source of data has not been used for measurement of the incidence of poverty in Canadian agriculture, and for that purpose I turn to estimates based on the 1967 Income Distribution Survey [3]. In the analysis of this survey, families were classified according to the occupation of the family head, based on his principal source of earnings, and low income families were identified by income cut-offs which were varied only in relation to family size. This analysis indicated that of the estimated total of 328,000 farmer families, 53 percent were in the low income category; while farmer families accounted for only 7 percent of all families in Canada, low income farmer families accounted for 21 percent of all low income families.

No statement on the income situation of Canadian farm families would be complete without reference to income instability. Unfortunately this is the area on which data are least adequate. Perhaps it will suffice to indicate the magnitude of the problem by reference to the fact that between 1961 and 1972, total realized net farm income in Canada varied, on a year to year basis, by an average of over 14 percent; of course, the variation at the regional level, let alone the farm level, was very much higher.

Turning from this cursory examination of the employment and income situation in Canadian agriculture, what can be said about the prospects? Consideration of the income and employment prospects for Canadian agriculture at this time inevitably raises the question as to whether we are witnessing a significant and lasting rever-

Table 5. Average farm and off-farm money income of farm households, by money income class, and with adjustments for household size, Canada, 1969

Income Class	Total Money Income	Farm Self-Employment Income	Off-Farm Income	Total Money Income	Farm Self-Employment Income	Off-Farm Income
	($ per household)			($ per person)		
Under $3,000	1623	542	1081	648	216	432
$3,000–5,999	4412	2378	2034	1037	559	478
$6,000–8,999	7329	5372	1957	1441	661	780
$9,000 & Over	12701	4959	7742	2221	867	1354
All Classes	5785	2575	3210	1377	613	764

Source: See Table 4.

sal in the terms of trade in favour of farm products. Certainly there are many observers of the international agricultural scene who hold this interpretation and expect future prices of farm commodities to remain at levels generally much higher than in the past two decades. Such a reversal would serve to accelerate the growth and commercialization of farm businesses and to ease the adjustment problem of nonviable farm operators. It would reduce the rate of decline in farm employment and provide some improvement in the income situation of farm families generally. It would not, however, radically alter the welfare problems of poverty in agriculture, nor would it significantly reduce the resource problems associated with production and market instability. In fact, the evidence for the prospect of "demand dominant" markets appears fragmentary and at best inconclusive. The experience of the past warrants considerable skepticism, even though from many policy vantage points " 'tis a consummation devoutly to be wished."

By contrast, we can count on changes in a number of key variables affecting employment and incomes in Canadian agriculture. According to the Economic Council of Canada, the overall growth of the economy in terms of real GNP will continue in this decade at least as fast as the 5.4 percent average rate experienced in the sixties [4, 5]. Moderation in the rate of population growth will yield a higher rate of increase in disposable income per capita than in the recent past, raising this variable by 1980 to about $4,400 (equivalent to an average household income of $14,000) in terms of today's purchasing power. However, continued rapid expansion of the labour force (at about 2.8 percent annually), due largely to the lagged effects of the postwar "baby-boom," will result in unemployment rates of around 5 percent persisting into the 1980's. Associated with these changes, the price of capital relative to the price of labour will continue to decline, encouraging the adoption and the further development of labour-saving technology.

These prospects do not auger well for the solution of relatively low income problems in agriculture. What size of farm operation in 1980 will be required to generate a family net income, after tax, of $14,000? How many farm operations can be expected to achieve that scale of business? What are the alternatives for those farmers who cannot expand their operations rapidly enough? The answers implied by these questions suggest that farm leaders and others concerned about incomes and levels of living among farm families, about rural population maintenance, and about rural community development would be well advised to take a more positive attitude toward the growth of larger farms and to adopt a much more constructive position toward the promotion of rural employment and multiple jobholding by farmers and their families. The dangers of encouraging careers in agriculture without due reference to future nonfarm employment opportunities should be only too evident.

Correspondingly, researchers need to provide more comprehensive and imaginative alternatives for the future development of the structure of agriculture. The neglect of the analysis of the levels and stability of farm family incomes and their determinants can no longer be defended on the grounds of inadequate data. Research on the structure and performance of rural labour markets in Canada has been virtually ignored, and yet it is crucial to provide information for the development of relevant rural manpower and community development programs. Finally, the analysis of employment and career decision processes, including the careful examination of the role of preferences, is central to a full understanding of farm income and mobility problems. It seems strange that while the basic concerns underlying farm income issues and justifying most farm policies are in terms of equity and of the welfare of farm people, agricultural economists have concentrated on resource allocation issues. In this paper I have tried to argue that the market system, despite its imperfections, does achieve a fairly high degree of efficiency in resource use in the short run, and that the major causes of low incomes and resource immobility in agriculture are to be found in the distribution of resources, in the preferences and degree of knowledge of the participants, and in the constraints which employment decisions impose on options in the long run.

References

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Sectional Meeting F

MANAGERIAL INFORMATION AND DATA SYSTEMS

Chairman: **Charles Beer**, USDA

Managerial Information (Recording, Data, and Decision) Systems in Canada

GEORGE E. LEE AND RAYMOND C. NICHOLSON

THIS PAPER deals with that quality of managerial support systems which bears on the ability of such systems to provide the manager with "information." If the paper itself is to have that quality which is described as "providing information," it must cause a change in the "knowledge" of those who hear it.[1] Furthermore, if the information contained in the paper is to have "value," it must cause a change in "knowledge" that in turn causes the receivers of this message to select future courses of action which lead to outcomes which have associated with them a greater amount of utility than would be associated with the outcomes of courses of action which would have been selected had this paper not been read.

The above brief statement demonstrates that while the concept of information can be broached in a very simple manner, i.e., in the manner of the second sentence of the opening paragraph, when one follows through to an evaluation stage, one finds a remarkable complexity in the linkage between information as input in a decision process and the output or final effectiveness of the information as used by an information receiving system. The dualism of this statement reflects the state of the arts in the application of the concept of information and in the operation of information systems in agricultural economics. In short, we do not have an acceptable "theory of information." Communication-based information theory[2] leads to a "quantity-of-information theory" which is useful in dealing with information transmission as a technical problem but is of doubtful value when dealing with the semantic or effectiveness problems of information transfer.[3] At the same time, a common sense evaluation of what is needed to find the value of information requires that the semantic and effectiveness problems be understood.

The lack of a theory of information has serious implications for the evaluation of managerial information systems (MIS). These implications can be developed by looking at the process of evaluation *per se.* John Dewey [3, p. 35] has concluded that all actions can be dichotomized into those which take place with an end in view, and those which take place without such an end. This seemingly simple statement takes on importance when one concludes along with Dewey that only the former type of act has value. From this, Dewey deduces that ". . . valuation takes place only when something is the matter" [3, p. 35] and then, that the successfulness of valuing an act depends upon two things:

> The first is the adequacy with which inquiry into the lacks and conflicts of the existing situation has been carried on. The second is the adequacy of the inquiry into the likelihood that the particular end-in-view which is set up will, if acted upon, actually fill the existing need, satisfy the requirements constituted by what is needed, and do away with conflict by directing activity so as to institute a unified state of affairs. [3, p. 34]

At first glance it would seem difficult to justify the statement that MIS in Canada has been developed without an end in view. An immediate reply to such a statement would be that economic theory has long been able to deduce the efficiency of resource use attainable when pure and perfect information is available to the micro or decision making units within the economic

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[1] There is much controversy in the literature concerning the definition of information [cf. 9, p. 24]. A classification of types of information is given later in the paper.

[2] We refer to the work originated by Shannon [17].

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[3] The three types of problems mentioned are examined by Weaver [15].

system. Surely we have for many years had the potential value of information clearly defined for us. On the other hand, have we really had a practical concept of the value of information to a decision making unit? An element which has not been explicit is needed to understand the problem. Dewey articulates this element as

> It is simply impossible to have an end-in-view or to anticipate the consequences of any proposed line of action save upon the basis of some, however, slight, consideration of the means by which it can be brought into existence. Otherwise there is no genuine desire but an idle fantasy, a futile wish. [3, p. 35]

The above suggests that if we are to be able to evaluate managerial information systems, we must, first, investigate and determine the lack or conflict that exists because of information not being available, and, secondly, determine alternative ways in which information can be made available and the degree to which each will overcome the conflicts caused by the lack of information. Thirdly and finally the two, i.e., the benefits and the costs, must be balanced and an evaluation arrived at.

It is the underlying hypothesis of this paper that the profession of agricultural economics has been overly preoccupied with the third step. It has assumed that it had adequately dealt with the first, and since a theoretical standard against which it could be judged was not available, the second step has largely been ignored. For these reasons the profession has not been able to carry out the third step effectively. In this paper we attempt to elaborate on the second step. By doing this we attempt to show how a lack of elaboration here has become a bottleneck in the process of evaluating and developing MIS in Canada. The subject will be introduced with a simple example.

A Simple Example

Consider a situation defined by one set of alternative actions and two sets of states of nature, each with only two possible outcomes. The choice for which case data will be supplied is that of applying (F) or not applying (NF) a particular level of fertilizer to a particular technical unit of land and cropping services. The states of nature are the presence (N_h) or absence (N_l) of a high level of nutrient prior to the cropping season, and the presence (R_g) or absence (R_p) of an adequate climatic condition during the growing season. The payoffs associated with each choice and state of nature are given in Table 1. The procedure that is appropriate either to find an optimal solution to this problem or evaluate the usefulness (value) of additional information to the decision maker will be related to the assumptions which the analyst is prepared to accept. Four types of assumptions have been examined in the literature.

Table 1. Data for fertilizer decision example

A Priori Nutrient Status	Climatic Outcome	Payoff Associated With	
		No Fertilizer	Fertilizer
Low (N_l) (.5)*	Favorable (R_g) (.6)	\$20	\$30
	Unfavorable (R_p) (.4)	\$16	\$20
High (N_h) (.5)	Favorable (R_g) (.6)	\$26	\$28
	Unfavorable (R_p) (.4)	\$20	\$20

* Figures in brackets give *a priori* probability of chance outcomes.

The first set of assumptions relates to the concept of information *per se*.[4] One may assume (1a) that information has the property of reducing the uncertainty held by the decision maker, or (1b) that information has the property of changing the belief of the decision maker. The former restricts the role of information to that of changing the probabilities of the states of nature while the latter includes this role plus the possibility of changing (expanding) the size of the Sets A and S.

The second set of assumptions relate to the concept of probability *per se*.[5] There are three prominent views concerning the nature of probability, therefore the analyst must assume one of these in his analysis. The three views, i.e., (2a) the logical, (2b) the relative frequency, and (2c) the subjectivist view are commonly known, but a clear definition of the one held is often omitted in works regarding decision and information problems.

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[4] Jamison [5, p. 28] describes the two assumptions we offer in this set as "alternative notions of semantic information." He suggests that the first is a special case of the second. We agree, but since much of the literature deals with this special case, it is necessary that this be clearly defined.

[5] The schools of thought regarding the nature of probability are well documented in many sources [cf. 6]. The views on probability as it relates specifically to information usage is examined by Jamison [5].

The third set of assumptions relate to the manner in which the payoffs of a decision situation are associated with the utility of the outcomes.[6] One may hold the view (3a) that the payoffs can be mapped onto the utility surface of the decision maker or alternatively (3b) that this is not possible.

The fourth set of assumptions are concerned with the type of information available. Szaniawski [19, p. 408] defines eight categories of information. These are:

(4a) categorical and precise information, i.e. $P(s_j)$ is either 0 or 1 and the information confirms or denies one of these values;

(4b) categorical and imprecise information, i.e. $P(s_j)$ is either 0 or 1, but the information adds only to the degree of belief regarding these values and is therefore only partial information;

(4c) probabilistic and precise, i.e. $P(s_j)$ is only knowable in a stochastic form, and the information defines the vector describing this distribution; and

(4d) probabilistic and imprecise, i.e. $P(s_j)$ is knowable in a stochastic form, and the information is in terms of the vector of possible distributions which describes the distribution in question.

In each of the above cases the information may come from a reliable source or secondly from an unreliable source. The latter situation gives rise to additional categories (4e) to (4h).

Given the assumptions (1a), (2c) and (3a) are accepted, the problem in question can be structured into a decision tree (Figure 1) and solved using conventional decision analysis.[7] For the given data and assuming a linear relationship between money and utility, the alternative of applying fertilizer is the correct choice.

If an additional assumption is made, e.g., information *re* $P(N_h)$ and $P(N_l)$ conforms to assumption (4a), the problem can be analyzed to show the expected value of such information (see Figure 2). Other cases of the fourth set of assumptions can also be analyzed; the reader is referred to Raiffa [12] for an examination of these cases. The example given shows that given the assumptions, a soil test which could categorically determine the pre-season soil nutrient level would have an expected value of $0.65 per technical unit minus the cost of such a test.[8] Under other selections of the fourth assumption the value of the test would be less than this. The exact expected value would be related to the nature of the information and its source.

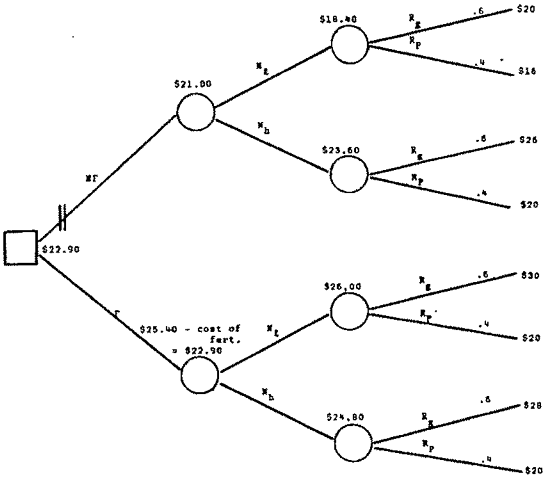

Figure 1. Decision tree analysis of fertilization question*

* Notation follows Raiffa [12], i.e., squares denote choice points and circles denote chance points.

The procedure for establishing the expected value of information as briefly outlined above has been known for some time [13]. Why then has it not been a part of the appraisal system used to evaluate and direct the development and operation of MIS? Several hypotheses spring to mind. Among these are: (1) the procedure is not logically consistent, (2) the procedure is not known to agricultural economists, (3) the procedure requires assumptions that negate its usefulness, (4) the procedure requires data not available, and, (5) the cost of the procedure outweights its usefulness. Hypotheses (1) and (2) must be heavily discounted because of the widespread acceptance of statistical decision theory and the widespread availability of texts and articles outlining its procedures.

Hypothesis (3) is hardly credible since it is not a serious criticism unless an alternative procedure using less limiting assumptions is available. However, there is one set of assumptions, namely set (4), which may lead to a situation in which hypothesis (5) becomes valid. When an assumption is made about the type of

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[6] This third assumption is often described as a choice between a linear and nonlinear relationship between payoff and utility [12, p. 9]. However, the more relevant assumption relates to the presence or absence of any defined relationship.

[7] An easily understood description of this process is given in [12].

[8] Situations in which the utilities of costs and returns are not comparable are discussed in [14, p. 62].

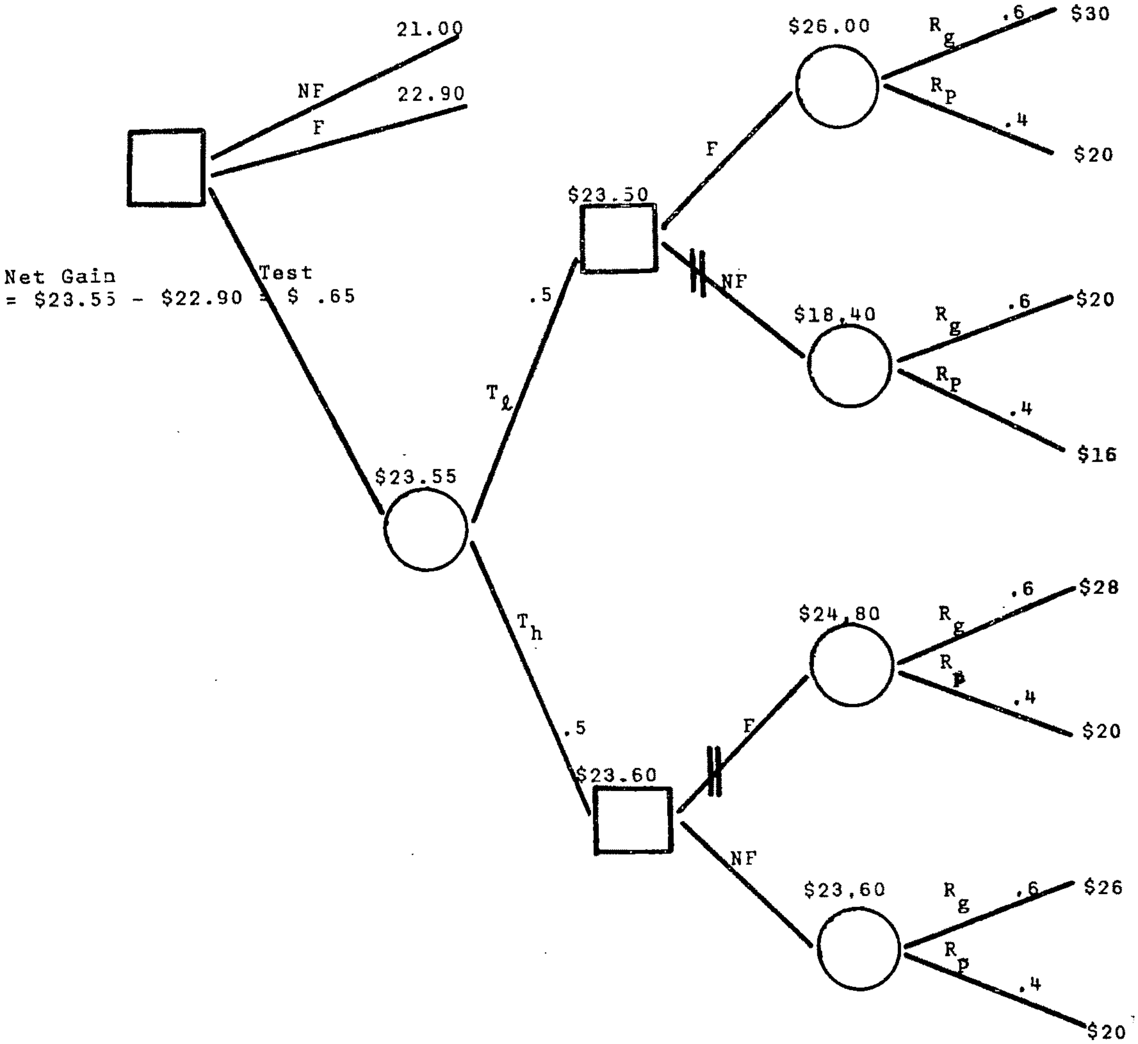

Figure 2. Tree diagram giving value of soil test

information coming to a decision maker, it is convenient to restrict the change in belief undergone by the decision maker to that associated with the obtaining of the information from the source being analyzed. In the real world it is seldom true that information concerning a set of actions or a set of states of nature is obtainable from only one source. Learning is seldom an on-off event. Beliefs are developed through a long process of sorting out information from many sources. It is a subjective process that does not submit to public knowledge. For example, our farm operator in selecting a fertilization strategy will have an historical belief concerning the value of fertilization and will adjust his degree of belief concerning the presence or absence of a high nutrient level prior to seeding based on many signals. These signals will include the previous history of the field in question, the climate of the previous year, and the soil analysis from neighboring fields. In order for the soil test of our example to have the expected value given by our answer, the condition must hold that the decision maker would always follow the fertilize alternative if he did not have the soil test information. If signals regarding soil nutrient level were available from other sources and the use of these signals improved upon the decision maker's ability to select when to fertilize, the value of the soil test would be less than the value given in our calculation.

For this reason the expected value of information as given by the above procedure is a "potential" expected value. The "true" value is known only after one observes how the decision maker would have reacted had the information under review not been available. Therefore the validity of the assumption regarding the type of information available to the decision maker is crucial in determining the accuracy of the answer obtained.

Hypothesis (4) is not valid since data are always available at a cost. In addition the procedure accepts data of varying quality. For these reasons hypothesis four degenerates into hypothesis five. Hypothesis five appears to offer an area of investigation which may bear fruit in aiding our understanding of the usefulness of managerial information systems. The implications of this hypothesis are discussed in the next section which describes MIS in Canada.

Managerial Information Systems in Canadian Agriculture[9]

Several organizations attempt to carry out at least some part of the function of a MIS for Canadian Agriculture. The total process can be viewed as three stages. Data must be collected, it must be made available, and its use must be understood. Processes involved in the collection of data of the type usable in the simple problem exemplified above include the following: farm record keeping, price and quantity outlook analysis, biological input-output research, climatic history, and, chemical testing laboratories. Each of these processes is engaged in by federal and provincial departments of agriculture, by universities, by numerous agribusiness firms, and by farm operators. The second step of extending or making data available to decision makers is also carried out by each of these units. All forms of the media play a major role in this area. The third step is largely confined to provincial extension and agribusiness activity although the other agencies listed play some part.

It is evident that, for the type of problem we have set up, the farm operator would have no shortage of *potential* data. Farm records might provide yield histories on this and/or other farms under various fertilization cost per acre to gross or net returns per acre; past cultural practices; past price relationships. Estimates of future prices are obtainable either from historical data or from outlook projections. Soils and crop scientists continually carry out fertilization trials and publish nutrient-crop input-output information. Rainfall and temperature records are available for most if not all agricultural areas. Laboratories which provide testing services are available to most farmers. We conclude that a wealth of data which *may* be transformed into information is available. How do farmers use this data? How are they assisted in its use?

The Saskatchewan Soil Testing Laboratory, when returning the results of a soil test, provides the farmer with estimates of the marginal return associated with the application of succeedingly larger quantities of nutrient [16]. These marginal returns are offered as deterministic, and the risk or variation in response is discounted for by recommending as optimal an application rate where the marginal return exceeds the marginal cost by about 50 percent.

The Farm Management Division of the Saskatchewan Department of Agriculture, in its training manual, [15] advises that fertilization rates be chosen based on a more nearly equal cost-return ratio. In most of the fertilizer budgets presented in this manual, a deterministic yield response is chosen. These examples are chosen because they are typical of the fact that, in many cases, all of the data available is not passed to the farmer and he is not assisted in using it in its fullest form. These cases show that much information is offered as being of type (4a) when in reality it is of type (4d). Is this desirable? To be very critical one could say that the data was being underutilized and misrepresented. Why must some be held back? Why must some be misrepresented?

When we turn from the very narrow resource use problem we have been examining to a total farm or to an industry wide decision problem, our analysis becomes more difficult. Either the number of alternatives and states of nature multiply by several orders of magnitude or our choice of dimensions must be such as to reduce the number to be considered. Information system models as developed in Canada have followed both of these alternatives.

One of the oldest models upon which a MIS for a firm or for an industry has been developed is that of an accounting system. An accounting system can be visualized as a mapping of economic events on to the financial state of a firm or nation. The elements of the set of economic events are given by the environment of the unit for which accounts are being kept. The elements of the financial state of the firm are defined as the subaccounts which have evolved through the testing over time of various possible account structures. The manner in which the two sets are related are the conventions of the accounting system in use.

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[9] This is not intended to be an exhaustive listing or description of all aspects of agricultural MIS in Canada since such a task is far beyond the scope of this paper.

Early farm accounts utilized a very small set of subaccounts to represent the financial state of the firm. Even with this small number of subaccounts it was found that information regarding "best" types of farm organization and "best" sizes of farms could be identified. The "factors affecting profit" were data which were offered to other farmers as information upon which future decisions could be made. Chao [1] has shown that information is lost in accounting systems in which the number of elements used to describe the financial state of the firm is not as great as the elements of the set of economic events facing the firm.[10] This is a formal statement of the intuitive feeling held by most agricultural economists that the traditional account book has the potential for more information than is normally contained in it. It was this feeling, prevalent at the same time that the necessary computer technology became available, that led to the Canadian Farm Management (CANFARM) Data System.[11] Before describing the CANFARM Data System, we will explore an information model that is at the other extreme in level of detail.

A farm simulation model for Western Canada, being developed by Lee and Sonntag,[12] attempts to synthesis a whole firm model by building together segments each of which contains the level of detail equivalent to that used in the fertilizer case outlined above. In this model a detailed decision tree is built via a computer program. Data is stored in matrices and an executive matrix in effect builds a decision tree to represent a unique farm situation relevant to the problem to be analyzed. The extent to which this model can be generalized and the trade-off between level of detail and cost of use which will eventually be determined is still under investigation. This model is, of course, not a data collection model but is rather a model which transforms data into information, i.e., it uses data to determine the effects of alternative courses of action. It relates to whole farm planning in the same way as the decision tree given above relates to the choice of a fertilizer strategy. In this model the value of additional data can be determined in the same manner (with basically the same assumptions) as the value of a soils test was established for our fertilizer case. The full potential of this model as a tool to evaluate the value of information from other components of a MIS has not been exploited. However, initial studies by Klein [7] and Cushon [2] show considerable promise in this area.

A distinct advantage of a simulation model of this type is that it is well adapted to taking explicit account of the type of information available to it. It, therefore, gives rise to a philosophy of planning of a character differing from that falling out of the use of categorical information-assuming models. This alternative philosophy is best described as that which attempts to explore rather than predict the future.[13] It makes operational a concept suggested by Wheeler [20, p. 200], i.e., "Our whole problem is to make the mistakes as fast as possible," in that it exposes choices which may lead to undesirable outcomes as often, or more often, than it isolates good moves. In the spirit of Popper [11], it obtains information by rejecting prospective moves (hypothesis) when their desirability is refuted. This characteristic may be of importance for MIS far beyond its methodological significance. Since it approximates the trial and error evolutionary process of common experience, it may be more acceptable to firm managers than are analytical optimizing procedures [8, p. 117].

The CANFARM System is a nation-wide federal, provincial, and university program designed to function as a comprehensive MIS. As a data system it attempts to extract the maximum quantity of data from farm records. It is set up so that an extremely low level of detail (large number of elements in the firm's financial state) can be maintained. This data is then aggregated as required.

In its information system aspects CANFARM is establishing a set of algorithms which can accept data from several sources and either select optimal, or explore the consequences of following arbitrary, alternative courses of action. In its role as a data system CANFARM has been able to marshal the resources necessary to establish the hardware and software required to perform the data sorting and aggregation operations The weak point in this system is that which occurs on the farm, where CANFARM has little direct control. We refer to the recording process which must be done by the firm. It has long been recognized that the cost of recording detail, even with a simplified recording form, may be greater than many farmers are willing to pay for the added detail. The optimal trade-off point between detail and numbers keeping records has not yet been determined.

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[10] The equality of the two sets is given as a necessary but not sufficient condition for an information channel free from loss.

[11] A description of the origin and initial development of CANFARM is provided by Plaunt [10].

[12] No publication is available describing the current state of this model. However, background to the model is given by [8 and 18].

[13] The value of this approach is described by Drucker [4].

A point that is often overlooked in regard to the question of the level of detail at which a farmer should keep records is that unless explicit use of *his own* record is made by himself, a farmer is rational in refusing to pay the cost of recording detail. Let us use an example to explain our meaning. A type of detail that is often asked for but seldom obtained from farm records in Western Canada is feed fed per animal. We must ask ourselves how the farmer's choice of future actions would change between the cases where he recorded and did not record the quantity of feed consumed by each animal in the prior period. In describing the advantages of record systems we often inadvertently insert the words *knew* and *know* for the words *recorded* and *record* in the above sentence. This change makes a significant difference to the value of that particular record. That is, there is a tendency to equate a recorded amount with information of type (4a) and an unrecorded amount as a complete lack of information. A closer examination of the case will show that the best of feed records provide information of type (4b). Any farmer familiar with livestock has other sources of information concerning feed utilization also of type (4b). The difference will lie in the reliability of the source. The change in knowledge offered by an individually recorded instance will in many cases be of relatively low quantity. Only an extremely high value per unit of information will cause the recording of feed fed to be a rational act.

It is necessary to remember that should a system such as CANFARM be in full operation, the farmer may have access to sources of information on feed requirements by type of animal and environment from the reports of farmers who have chosen to record data leading to this information. Under current institutional arrangements this alternative provides cost free information. The rational farmer may then choose between his own recorded data (at the cost of having to record it) or data from other farms (at no cost). The quantity of information arising from the use of his own data would have to be substantially above the quantity arising from the free data before this would be a rational choice.

The above argument has direct implications regarding the procedures and structure necessary to ensure a more smoothly functioning data recording system for Canadian agriculture. It is a concrete example of the kind of analysis of the "lacks and conflicts of the existing situation" which must be completed in evaluating MIS.

A further major component of the MIS related to agriculture in Canada is that which can be referred to as survey statistics. This is defined to include those activities by federal and provincial governments which attempt to find out what is or has gone on in regard to firm, regional, or national units. In many respects these systems are similar to accounting systems in that they record past events. The major difference between farm accounts and more aggregative accounts is that the recording for the latter is done by staff whose employment is defined as that job. This aspect gives rise to less restrictiveness in the recording of events but also causes the usefulness of the analyzed data obtained from such recording to be more restricted.

The component of the MIS composed of agricultural research scientists, usually referred to as physical research, was briefly mentioned earlier in this paper. However, some additional comments are necessary. The quest for data for the simulation project mentioned above has exposed the senior author to the wealth of recorded events available in the hands of the agricultural research scientists in Canada. It is not possible to offer concrete evidence of the quantity of data thus available, and it is true that much of it is not in a form readily convertible to decision systems of the type commonly employed by decision makers. However, the recorded activity of a large number of dedicated scientists offers a large potential for those searching for basic data. The exploitation of this data is only held back by our lack of imagination and ingenuity in devising decision systems which can incorporate it into their structure.

The current status of MIS associated with Canadian agricultural can be summarized through the use of the following model. We view a MIS as that process which collects or records data, processes that data, and changes the beliefs of managers. This can be viewed as three subsystems, namely a recording system, a data processing, and a decision making system. Each subsystem can be viewed as a communication channel. The first is a channel between the physical world and an initial record. The second is a communication channel between an initial record and a publication made widely available. The third is a communication between a publication and the mind of a decision maker.

We refer to the potential ability to communicate in any of these three processes as the channel capacity of that process or subsystem. The potential ability of the MIS, then, is restricted by the lowest channel capacity in any of the three subsystems operating in sequence. The major components of the Canadian MIS, along with the authors' views of the channel capacity of each, are shown in Figure 3. The width of the segments for each component listed in Figure 3 are estimates of the potential of each in the overall MIS. The segment widths are relative within a component and apply less directly across components within a stage. The relationships are drawn from judgments arrived at through the analysis presented above, and are thus largely subjective. It is, however, the only type of information we have available for this analysis. Due to space limitations, the discussion of Figure 3 will be carried out in the conclusion.

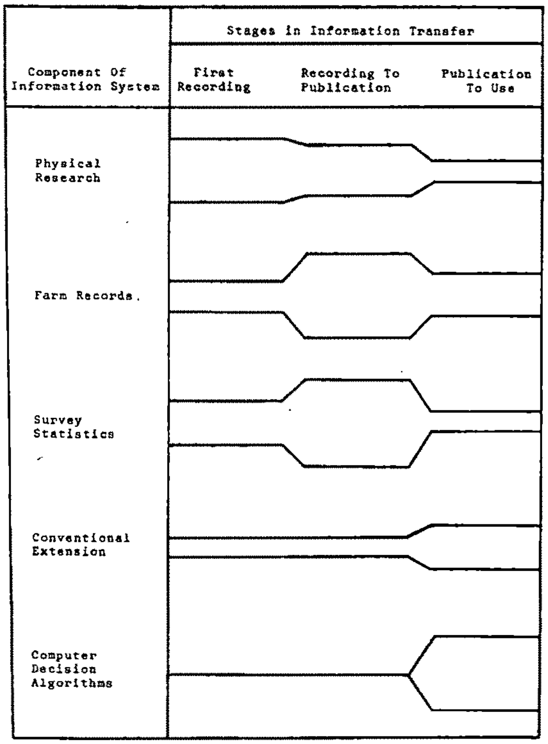

Figure 3. **Relative channel capacities of selected components of the information transfer process**

Conclusions

The overview of information, procedures for its measurement, and the major components of the Canadian agricultural MIS given above lead to the following conclusions.

There is at present no operational framework upon which a wide variety of MIS can be evaluated in an objective manner.

Specific cases of information use that can be measured lead to the belief that an intuitive appraisal of specific data tends to overvalue that data as potential information. This is so since the "real" value is related to the next best source. This next best source is often overlooked. Since there is a wide variety of independent sources of information, the evaluation of one in isolation is not a useful procedure.

In regard to who pays the cost of obtaining information, the value of information to the individual must be analyzed relative to the value of that information to society. Farm data may be similar to research data in that, in some cases, the individual is not justified in obtaining it while society may be. Farm records are not a *free* source of data. The question of who should pay their cost has not been examined sufficiently.

When the major components of MIS in Canada are looked at in total, there appears to be a relative over-capacity in the data system stage compared with the data recording and decision system stage. Several conclusions can be drawn from this. Firstly, in planning future programs, each agency must examine the most restrictive stage in their own communication channel. Secondly, it is important that agencies with extra capacity in one stage do *not* draw back that capacity to the capacity of their most restrictive stage. While such a drawback may lead to efficiencies in the short run, it may be very costly in the long run. Thirdly, agencies must examine the possibility of coordinating their activities especially in the more restrictive stages of each component. The strong points of each component must be exploited in order for the effectiveness of the overall MIS for Canadian agriculture to be improved.

The most serious defect in the structure of MIS for agriculture in Canada is the large number of independent components and institutions within components that make up such a system. This has led to an attempt by each to be a complete or total MIS. If the decision problems which face the firm, a region, or the nation in agriculture are examined so that the data required to analyze these problems is displayed, it is soon seen that a single comprehensive system is in Dewey's words an "idle speculation." At the same time, it is desirable that an attempt be made to bring the active institutions together. CANFARM is a start in this regard in Canada. However, even though CANFARM is a federal, provincial, and university program there are major components of the agricultural MIS not directly involved. We refer specifically to the Research Branch of the Canada Department of Agriculture as well as Statistics Canada.

The second most serious defect in the operation of MIS in Canada is the lack of development in the conceptual area. Professor Eisgruber, in the companion paper to this one, has outlined a plan to overcome this problem in the United States. We have not developed a parallel plan for Canada, although CANFARM can be considered a partial step in that direction. Such a plan must be developed and, more importantly, must be carried through to completion.

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Managerial Information and Decision Systems in the U. S. A.: Historical Developments, Current Status, and Major Issues*

LUDWIG M. EISGRUBER

> **"One should hardly have to tell academicians that information is a valuable resource; knowledge *is* power. And yet it occupies a slum dwelling in the town of economics. Mostly it is ignored: The best technology is assumed to be known; the relationship of commodities to consumer preference is a datum."**
>
> G. J. Stigler [44]

THIS IS A TIME when public scrutiny of the use of public funds is at high levels and promises to continue to rise simultaneously with a decrease in public funds available for research and development. Since considerable amounts of public funds have been and are being expended on information systems, this alone is ample justification for an examination of historical developments, current status, and major issues relating to managerial information and decision systems. However, there is perhaps a more important reason. Computer based information and decision systems play an increasingly pervasive role in our profession, for our clientele, and, indeed, in our society. Thus, it becomes imperative that we understand the potential and limitations of these systems as well as the impact of alternatively structured systems on that portion of society which we consider to be our clientele group.

Historical Development and Current Status of Managerial Information and Decision Systems

While emphasis will be on managerial information systems, broader based information systems cannot be ignored, since managerial decisions are frequently based on considerable information from many sources, including the news media [cf. 35]. Thus, the concept of "managerial information and decision systems" as viewed in this discussion is broader than accounting and budgeting and includes decision models based on linear programming (L.P.), simulation, data series, market information, and regulatory information, among others. Thus, the concept provides for a system which may deliver any type of information to the decision maker for the purpose of changing his knowledge so as to enable him to select future courses of action which lead to outcomes which have higher net payoffs than would otherwise be the case.

Similarly, while the bulk of discussion will deal with university based systems, a number of side trips to commercial and government based systems will be included. Finally, the section on historical development is intended to be just long and detailed enough to increase understanding of why we are where we are with information systems and to support later comments on critical issues and their possible resolutions.

Historical developments

We shall place the beginning of computer supported information and decision systems into the early fifties, when agricultural economists (and economists in general) became interested in the analytical potential of mathematical programming models and their various special forms, in particular linear programming and transportation models. Interest in these models grew rapidly. Only one agricultural economics department in the U. S. used L.P. in its research work in 1950, and none taught linear programming or used it in adult education. By 1960, 12 departments taught L.P. in separate courses, 31 taught it as part of another course, 41 used it in their research programs, and 14 had used it in their continuing education programs [12]. At least one professional farm management service[1] is known to have used L.P. on a commercial basis for farm planning by that time.

In the early 1960's, interest in the development of computerized information and decision

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* The author gratefully acknowledges the helpful discussions and reviews received from several colleagues, in particular W. Candler, G. Harrison, R. Rades, and H. Walker.

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[1] Doane's Farm Management Service.

systems grew outside the university and federal government community. This interest was expressed as well as enhanced by several nationwide symposiums sponsored by the International Business Machines Corporation in 1962 [25], 1963 [26], 1965 [27], 1966 [28], and 1969 [24]. The agribusiness press also showed considerable interest in the topic.[2] Of course, numerous university and government sponsored conferences were held,[3] and a considerable amount of literature was generated. Those conferences and papers were no longer confined to linear programming and transportation models, but discussed and explored a variety of models and techniques, such as dynamic programming, simulation, management games, and automated budgeting. Also, there was considerable balance between farm and nonfarm business management applications. Finally, there was considerable effort to demonstrate the usefulness of these systems in continuing education and real life management decision making, although on the whole the flavor remained to be one of research, development, and experimentation.

Beginning in the mid-fifties, another development in the area of managerial information and decision systems gathered momentum. This time, the main interest centered with continuing education specialists, and their goal was to develop computerized accounting systems for managerial decision making. Michigan State's Telfarm Program, which had its birth in 1957, was pace setting. A number of states started farm account projects shortly thereafter, and they exchanged their experiences in several conferences [8, 16, 31, 45]. In 1968, there were 28 computerized accounting systems which were, either in part or in total, supported by the Extension Service [32]. Commercial interest in computerized farm accounting was strong, and there were 20 bank associated programs in operation in 1968 [2]. In addition, there existed 24 Farm Bureau projects or Farm Bureau pilot projects, and independent computerized services operated in at least five states [41].

Nominal efforts were made to develop the account projects towards some degree of usefulness for macro-economic analyses [13, 30, 42]. However, these efforts did not result in tangible results. While there were numerous reasons for this, the major reason probably was the conflict between objectives of providing data for managerial decision making, continuing education, research, and public decision making. The primary interest of those who supported the development of computerized account projects obviously were with managerial decision making and continuing education, and consequently account projects developed in those directions.

The problem of duplication of efforts was constantly present. This resulted in a number of coordinating groups, such as the National Coding Task Force, the National Advisory Committee for the Experimental Management Educational Program, the National Advisory Committee for Coordination of EDP Farm Management Programs, and the National EDP Coordinating Committee. These groups, in turn, sponsored a number of conferences or reports [5, 8, 45], and additional reports and even a book are still in the making or at least on the drawing board. While few would contend that these various coordinating and advisory groups accomplished the maximum degree of coordination and cooperation, it is clear that they did have beneficial impact by improving communications between states without smothering creativity and the desire and possibility to experiment (on a reasonable scale) with new ideas.

The current status—a quantitative and qualitative assessment

While the above brief treatment of historical developments of computer supported decision and information systems cannot do justice to a number of aspects of the total effort, it does point out the considerable amount of resources which has been devoted to this activity. Where, then, did all this bring us?

Number of clientele reached.—The question of when we have reached a "large enough" segment of our clientele will be answered differently by different people. Some may view it as a reasonable degree of accomplishment if we have, to date, reached about 12 percent of our clientele at least once. Table 1 points out that this appears to be the case in at least two Midwestern states (if we view farmers as one of our clientele groups). It is probably not an unreasonable hypothesis that these data are typical for other states. Furthermore, Table 1 does not provide information on the considerable impact which management games, automated accounting systems, and planning models have made in food processing and marketing.

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[2] For example, see [1, 11, 23, 29, 41].

[3] For example, see [5, 9, 14, 15, 17, 38, 39, 40].

Table 1. Percent of farmers who have ever used the computer to help them make farm management decisions (including record keeping), 497 Illinois and Indiana farmers, 1972

State	Have Used Computer (Percent)	Have Not Used Computer (Percent)
Illinois	12.2	87.8
Indiana	11.2	88.8
Both States	11.7	88.3

Source: G. A. Harrison and L. M. Eisgruber, Farmers' Use, Needs, and Sources of Information (in preparation), a study supported by a CSRS grant to analyze "Computer Supported Information and Decision Systems for Soybean Production."

Software availability.—The latest "Inventory of EDP Programs Used in Agricultural Extension" [33] provides brief descriptions of 425 computer programs reported by 47 states and Puerto Rico. "However, the total of 425 is somewhat of an approximation. The precise number is difficult to fully ascertain because of the apparent interlocking of some programs" [33, p. iv]. This Inventory covers farm as well as agribusiness programs, and it also provides at least a partial listing of services offered by commercial computing and management services. Finally, the Inventory reports that the 425 computer programs were utilized to the extent of approximately 67,848 runs during 1972.

Status of technology.—An examination of the wide range of model types, model sophistication, and hardware used brings one to the conclusion that our profession is well acquainted with the "state of the arts" and that the "state of the arts" is such that it is not a bottleneck. To be sure, we will need to continue to study questions of data file organization, algorithms, types and appropriate use of terminals, terminal versus minicomputer, etc. However, these questions do not appear to be the truly critical issues at this time.

The profession appears to be enthusiastic about the potential of terminals, and there is evidence to justify this enthusiasm [38].[4] There do appear to be considerable questions yet regarding the appropriate delivery system [cf. 19].

Coordination.—Coordination has many dimensions. One is that of cooperation between the research staff and the extension staff, and in this respect the degree of cooperation is high. Another dimension is that of cooperation between states. There is some sentiment that this cooperation should be better and perhaps be formalized [38, pp. 121–158]. Nevertheless, substantial cooperation across state lines exists in terms of exchange of computer programs, use of each other's computer programs, testing of techniques and hardware. To be sure, there is always room for more cooperation, either formal or informal. But increased levels of cooperation, particularly if cooperation is to be formalized or institutionalized, need careful planning in view of some of the "critical issues" mentioned below.

A third dimension of cooperation is that between university and government on one hand and agribusiness, computer, and management services on the other. Our record in this area is to date at best spotty, and it is better in nonfarm management applications than in farm management applications. Of the various dimensions of cooperation, this is perhaps the least developed one.[5] Since it is connected with the question of user fees, use of public expenditures, and income redistribution, this is one area which will need our attention.

Critical Issues

The major issue: lack of a comprehensive concept

If the above qualitative and quantitative assessment of the current status of computer supported managerial information and decision systems is correct, then it appears that we are at a point in time where we need to develop a comprehensive concept of an information system.[6] To those who labor in the field of computer supported information systems on a day by day basis, this may not be a very useful or exciting exercise. Instead, they may be more concerned with the evaluation of a new algorithm, the evaluation of a new terminal, etc. But, evaluation with respect to what? Unless a comprehensive concept of what constitutes an efficient, or socially desirable, choice of an information system is available, evaluations of the type listed above will become largely subjective.[7]

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[4] A survey by Harrison and Eisgruber in Illinois and Indiana provides additional evidence. Of the farmers interviewed, 32 percent thought they would use terminals if available, 20 percent answered negatively, and 48 percent were undecided.

[5] The situation of workers in the information systems area is not much different than it is with the profession in general [cf. 10].

[6] Fuller [18] addresses himself to these general issues, but ignores questions of distributional impact and information base.

While a model developed by Marschak [34] is not the only available model, it will serve to demonstrate the kind of framework which I propose we shall need to develop (followed or accompanied, of course, by appropriate empirical work, applications, and implementations).[8] In its simplest form, Marschak's model says that an efficient choice of an information service is that which maximizes expected gross payoff minus expected costs, i.e.,

(1) Max: $D = E(g) - E(k)$
where $E(g)$ = expected gross payoff
and $E(k)$ = expected cost
and, further,
(2) $E(g) = G(\lambda,\alpha;\Pi,\gamma)$
(3) $E(k) = K(\lambda,\alpha;\Pi,\varkappa_{\lambda}:\varkappa_{a})$

where λ = the process of inquiring (collecting information, experimenting);
α = the process of deciding;
Π = probability that certain events will occur once a decision is made;
γ = benefit (payoff) function;
$\varkappa_{\lambda}$ = cost of inquiring;
$\varkappa_{a}$ = cost of deciding.

The semicolons in equations (2) and (3) separate the entities "controlled" by the manager from those "noncontrolled" by him.

The above model is relatively simple. Indeed, it is, with minor modifications, the profit maximization equation presented to students in introductory economics courses. It should be evident, however, that empirical application of this conceptual model to the choice of an efficient information system for agriculture is not a simple matter. It will require ingenuity and hard work, and the lack of data will be a vexing problem. Yet, how can universities continue to expend literally millions of dollars of public funds annually on the development of managerial information systems, how can we propose to develop and institutionalize state-wide computer networks, how can we preach the gospel of "technology assessment" and "cost/benefit analysis" if we do not know the information called for by the above conceptual framework?

The development of a comprehensive *concept* of an information system will not necessarily result in the development of *one operational system*. Instead, it is more likely that the comprehensive concept will lead to the conclusion that, due to differing circumstances, different *operational systems* are appropriate and that the pursuit of the one definite operational system is not as productive as the concentration on individual improvements. However, the comprehensive concept will aid in deciding which of the many possible individual improvements should receive priority.

Distributional impacts

"The distributional impacts of public programs are important, and are becoming more important" [7]. Those engaged in the development of information systems cannot ignore this public attitude.[9] Information in Table 2 will dramatize this point. While many of us have long speculated that computer supported information and decision systems are relatively more valuable to the large business and the better educated manager, the magnitude of the difference in percent of farmers reached may be surprising. These data may also induce us to cease intellectualizing along lines that the computer helps us reach more farmers, and that there is no reason why the computer should not be useful to the small business. According to Table 2, the facts are that we are reaching relatively few of the small and less educated farmers. If we do not think that this is the way it should be or if we think that this is not the way society wishes to have public funds expended, then we need to find out what the characteristics are of an information system which will reach other segments of our clientele.

Related to this issue are the ever present questions of what constitutes continuing education (clearly a charge to the universities and the Extension Service) and what constitutes a (quasi) commercial service (not necessarily their responsibility), under what circumstances should user fees be charged, and how large should these fees be. The above conceptual model can, with appropriate modifications, help provide answers

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[7] One can, indeed, hypothesize that, in the past, proposals for a more formal cooperation between institutions were not rejected so much because they "sailed into the doldrums of state pride" [38], but much more so because those who had to make the final decision in this matter were of the opinion that we were still in a phase of development where there was too much danger of institutionalizing a more or less arbitrarily and subjectively constructed information system.

[8] Other models of potential interest can be found in [3, 4, 6, 20, 21, 22, 36, 37].

[9] There may be increasing support for this view. See, for instance, Schoonaert [43].

Table 2. Percent of farmers who have ever used the computer to help them make farm management decisions (including record keeping), 497 Illinois and Indiana farms, 1972, by gross income and education

Gross Income ($)	Have Used Computers (Percent)	Have Not Used Computers (Percent)	Education (Years)	Have Used Computers (Percent)	Have Not Used Computers (Percent)
19,999 or less	2	98	0–8	7	93
20,000–39,999	6	94	9–12	11	89
40,000–59,999	16	84	13–15	15	85
60,000 or more	24	76	16 or more	23	77
All Farmers	12	88	All Farmers	12	88

Source: G. A. Harrison and L. M. Eisgruber, Farmers' Use, Needs, and Sources of Information (in preparation), a study supported by a CSRS grant to analyze "Computer Supported Information and Decision Systems for Soybean Production."

to these questions. And again, we are dealing with a difficult question which we simply cannot afford to ignore.

Broadly based information systems

As we design information systems for agriculture, it is imperative that we consider alternatives of designing systems which are more broadly based than our traditional concerns. Now that we have generally mastered technology, we need to broaden the orientation of the management system with respect to types of information, audience, and complementarity to information systems outside agriculture proper. The manager uses a considerable amount of information which is technical in nature. Thus, any attempt to develop a comprehensive information system must be interdisciplinary in nature.[10] To some extent this is already the case,[11] but a more deliberate recognition of this fact is needed.

The orientation of an information system should not be narrowly towards one group, such as farmers. Some information, such as market information, will be useful to a broader group,[12] thus increasing the expected net payoff of the system. Data series, while primarily used for macro analysis, do have implications for a wide range of problem areas, including farm management, agribusiness, policy, marketing, community development, and resource economics. Decision makers do use a variety of information sources. The sources differ significantly depending on the kinds of decisions to be made (see Table 3 for an illustration of this point). Since those sources of information do already exist, new information systems should not duplicate them unless it can be done cheaper or better. Otherwise, new systems should be coordinated with existing ones.

Possible Next Steps

It is unquestionably possible to shed light on some aspects of the aforementioned "critical issues" by individuals devoting part of their time to an analysis of these issues on an informally coordinated basis. However, any reasonably exhaustive and rigorous treatment of these issues requires an approach with substantial thrust and coordination. Therefore, the following specific approach is suggested:

Formation of a working group.[13]—It should be requested that the State Experiment Station Directors, or the ECOP Directors, or a subcommittee (joint between the two or otherwise), or an individual (or group of individuals) designated by either the State Experiment Station Directors, the ECOP Directors (or both) constitute a Working Group with the charge that the Working Group perform a comprehensive analysis of the critical issues raised above.

Working group parameters.—The Working Group should consist of three to five individuals,

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[10] A good case in point is VPI's project on the use of chemicals in agriculture, which enlists not only the expertise of other university departments but also the cooperation of the Environmental Protection Agency.

[11] Examples are the feed mix models.

[12] Again, VPI's project on the use of chemicals in agriculture is a good case in point. This project addresses itself to information needs of farmers, regulatory agencies, distributors, and retailers.

[13] The appropriate choice of a term caused considerable anguish to the author. Other terms such as "Task Force," "Advisory Committee," "Consortium," come to mind quickly. But equally quickly, these terms conjure up in the minds of many certain concepts of responsibility, organization, etc., none of which fit the proposed approach.

Table 3. Farmers' sources of information for selected crop management decisions, 497 Illinois and Indiana farmers, 1972

Crop Management Decision	Percent of Times Farmers Listed the Following Information Sources for Selected Crop Management Decisions									
	Television	Radio	Newspaper	Farm Magazines	Extension Service	Local Elevator	Own Experience, Records, etc.	Lending Agency	Lawyer or Accountant	All Other[1]
Acres of corn or soybeans to plant	1	4	6	15	9	2	34	1	0	28
Planting (row width, depth, population, etc.)	0[2]	0[2]	1	16	10	1	37	0[2]	0	35
Weather and timing of operations	20	24	9	5	4	0[2]	28	0	0	10
Use of pesticides and insecticides	1	2	2	17	14	5	25	0[2]	0	34
Marketing (when and how to sell)	4	11	11	12	4	19	23	2	6	8
Price outlook	4	11	14	22	11	13	12	1	0	12
Whether and where to borrow money	0[2]	0[2]	0[2]	4	3	0	34	45	3	11
Tax management	0[2]	1	3	13	8	0	25	4	30	16
Adjusting to farm policy, legislation	4	7	12	19	16	1	21	1	2	17

Source: G. A. Harrison and L. M. Eisgruber, Farmers' Use, Needs, and Sources of Information (in preparation), a study supported by a CSRS grant to analyze "Computer Supported Information and Decision Systems for Soybean Production."

[1] For a more detailed breakdown of "All other" see the above study.

[2] Rounded to zero.

none of whom should spend less than 75 percent of their time on the Working Group's project throughout the existence of the Working Group. The members of the Working Group should be selected on the basis of their ability to conceptualize and analyze and their familiarity with all aspects of information systems. Whether an (otherwise qualified) individual happens to be an extension or research appointment is irrelevant. Care should be taken to select a group of individuals so that an appreciation for a wide range of subject matter (farm management, business management, econometrics, community development, technical agriculture, computer science, etc.) is assured. Administrators should be conspicuous by their absence from the Working Group.

Not all members need to be located at the same institution, although some concentration is desirable. The Working Group should have the flexibility to ask for cooperation from individuals who are not members of their group, as the need arises. Once established, the Working Group should be permitted to do its work without interference from groups such as "advisory committees." If the group is effectively constituted in the first place, it will realize when it needs advice and where to seek it.

Financing.—There exists a large number of approved research and extension projects which can legitimately accommodate the work we propose needs to be done. Thus, "off-the-top funding," contributions from each or some stations, etc. are not essential to the proposed approach. Needless to say, if additional funds can be made available from CSRS, FES, ARS, ERS, or other agencies, it can be expected that both the scope of the project and the usefulness of the results would be improved.

Time frame.—The Working Group should be constituted as soon as possible, and it should be given no less than one year and no more than three years to complete its work. The specific time frame should be developed by the Working Group at the time of its constitution. Once a time frame is established, the Working Group must be dissolved at the end of the specified time period.

Elaboration on the working group's charges.—It would be inappropriate to specify all aspects of the Working Group's charges at this point. Doing so could be detrimental to the effectiveness of the Working Group. However, some elaboration on the general charge to the group to "perform a comprehensive analysis of the critical issues" is necessary in order to permit an evaluation of the approach.

The Working Group should not consider itself to be merely a review committee. Instead, it should aim to conceptualize, collect primary and secondary data, analyze, and evaluate. Consequently, the group will need to develop a specific set of objectives and procedures. The objectives should revolve around the general question of the nature and characteristics of alternative information systems. Such alternative information systems might be simulated, and the analysis could be carried out in the framework of a (partial) factorial design. Factors, and factor levels, which suggest themselves for such a design are the following, among others: geographic coverage (state-wide, region-wide, nation-wide), clientele (farmers, country elevators, municipal governments, etc.), computer base (university, private), orientation (education, service), and so on. Criteria by which alternative systems may be evaluated are cost, total benefits, and distributional aspects, among others. Data problems will be encountered (along with the usual difficulties of modeling), but it is our judgment that a sufficient data base exists to consider this approach, which, in turn, will point out crucially needed data for the future.

Closure.—In order to assure that the results generated by the Working Group be transmitted to those who need it, it is suggested that one or more of the group members conduct at least one seminar and in-depth discussion in each of the regions. These sessions should be completed prior to the aforementioned termination date, and appropriate written materials should be available at that time. The Experiment Station Directors or ECOP directors should develop policy guidelines for the development of Land Grant-USDA associated information systems within about six months after the Working Group is dissolved.

Finally, this suggested approach to the development and empirical evaluation of a comprehensive concept should not be viewed as either forcing uniformity, forcing greatness, or keeping an individual (or individuals) from performing the necessary analysis. Instead, it is intended to be a catalyst.

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Sectional Meeting F

MANAGERIAL INFORMATION AND DATA SYSTEMS

Discussants: T. Alfred Petersen, University of Alberta; R. Black, Michigan State University

Sectional Meeting G

MINORITY PROBLEMS AND AGRICULTURE

Chairmen: Percy R. Luney and Anne E. Hammill,
Office of Equal Opportunity, USDA

Migration Patterns of Minorities in the United States

Calvin L. Beale

The purpose of this paper is to extract some findings from recent census materials that will add to or update existing knowledge about the rural-to-urban migration patterns of the three largest racial minorities in the United States—blacks, Mexican-Americans, and American Indians.

Blacks

As is well known, the migration pattern of the black population of the United States has had two main features: an exceptionally strong rural-to-urban movement, in the course of which most of the movement has also been from the South to the North and West. During the 1950's, an estimated net outmigration of 1,568,000 Negroes and persons of other nonwhite races took place from the nonmetropolitan parts of the South (Table 1). At least 98 percent of this number consisted of blacks. In the 1960's, this net outmovement dropped somewhat to about 1,346,000, a decline of 14 percent. But, the remarkable point is that between the same two decades, white net outmigration from the same nonmetro counties of the South fell from 2,686,000 to 123,000, a drop of 95 percent. Thus, whereas a majority of the South's net movement from rural areas and small towns was white in the 1950's, the overwhelming majority of it was black in the 1960's.

There proved to be 250 Southern counties containing significant numbers of both races in which the white population engaged in net inmigration during the 1960's at the same time that the black population continued to show net outmigration. The two populations have often responded differently in recent years to a given set of local, rural, and small town circumstances. The nonmetro South as a whole has had remarkable nonagricultural economic growth, but for whatever combination of reasons, the effect of this growth on greater population retention has been almost entirely among whites. Black net outmigration in the 1960's was 23 percent as large as the total black nonmetro population at the beginning of the decade. Because black rural and small town birth rates are comparatively high and the age structure is young, this large outmovement resulted in only a small decline (4.5 percent) in the Southern black nonmetro population.

The bulk of the displacement of blacks from agriculture is now completed. Most of the mechanization of cotton occurred during the 1960's. By 1971, only one percent of Southern cotton was still harvested by hand. Substantial rationalization of tobacco production has also occurred, as has mechanization of peanut harvesting. These are the only three farm enterprises that involved significant numbers of black farmers or resident hired workers. So strong have the forces of farm displacement and urban attraction been in recent years, that the total nonwhite farm population of the United States—of which about nine-tenths is blacks—declined by 64 percent in the single decade from 1960 to 1970. Thus, the farm element of the black nonmetro population is much smaller than it used to be. Although the number of blacks in agriculture is continuing to diminish, it is now the trend in the nonagricultural black population that will most determine the overall future numbers of blacks in nonmetro areas as a whole. Not more than 15 percent of the Southern nonmetro black population could be classed as farm residents today.

With the buildup of metropolitan areas, and the coming of age of the large number of persons who were born in the cities in the last generation, more of the migration into almost any metro area now consists of people moving in

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Table 1. Population change and net migration in the South by race and metropolitan status, 1960–70

Race and Residence	Population		Percentage Change	Net Migration			
				Amount		Rate[a]	
	1970 (Thou.)	1960 (Thou.)	1960–70 (Pct.)	1960–70 (Thou.)	1950–60 (Thou.)	1960–70 (Pct.)	1950–60 (Pct.)
Total	62,795	54,973	14.2	590	—1,425	1.1	— 3.0
Metropolitan[b]	34,828	28,564	21.9	2,059	2,830	7.2	13.7
Nonmetropolitan	27,967	26,409	5.9	—1,469	—4,255	— 5.6	—16.0
White	50,327	43,477	15.8	1,806	37	4.2	.1
Metropolitan[b]	27,939	22,909	22.0	1,929	2,723	8.4	16.5
Nonmetropolitan	22,388	20,568	8.8	— 123	—2,686	— .6	—13.2
Negro and other races	12,468	11,496	8.5	—1,216	—1,462	—10.6	—14.1
Metropolitan[b]	6,889	5,655	21.8	130	106	2.3	2.6
Nonmetropolitan	5,579	5,842	—4.5	—1,346	—1,568	—23.0	—25.2

[a] Net migration as a percentage of population at beginning of decade.

[b] Metropolitan areas as defined in 1969 for 1960–70 data and 1963 for 1950–60 data.

from other metro areas, rather than from the countryside or small towns. But although most metro areas outside of the South received more blacks from other metro areas than from nonmetro areas in the recent period 1965–70, the fact remains that the majority of blacks moving to the metro areas of the North from the South during those years came from nonmetro areas. It was only the intraregional exchange of blacks between metro areas of the North and West that led to such areas receiving more total migrants from metro sources than from nonmetro areas. The interregional South to North movement was still comprised by nearly a three to two ratio of persons from nonmetro areas [5]. Furthermore, most of the major Southern cities—Atlanta, New Orleans, Miami, Houston, Dallas, Memphis —received more blacks from rural areas and small towns than they did from metro areas.

Because of the settlement patterns in the Southern areas from which individual non-Southern metro areas draw migrants, plus differences in the propensity of a given metro area to attract people of nonmetro origin from a particular Southern state, there are substantial differences in the metro-nonmetro mix of migrants received by different major cities, presumably with attendant consequences in the receiving cities. Chicago is the major city with the largest component of rural and small town people in its recent Southern black migrant stream. From 1965–70, 70 percent of all black migrants to Chicago from the South came from nonmetro areas [5]. Chicago draws most heavily from Mississippi, which has only a comparatively small metro population. By contrast, the New York area received 56 percent of its Southern black migrants from nonmetro areas, and Los Angeles received just 44 percent. Los Angeles' low proportion of nonmetro migrants is partly derived from the prominence of Texas as a source state, for Texas has a large metro black population. But differences in propensity to draw metro or nonmetro migrants from a common source were also evident. For example, the proportion of black migrants from Mississippi to Los Angeles who came from a metro area (Jackson) was double that of the proportion to Chicago from Mississippi who were of similar origin (16 percent versus 8 percent) [5].

Preliminary estimates of net migration by age in the 1960's are available for the nonmetropolitan South from cooperative work of the Department of Sociology, University of Georgia, and the Rural Development Service, funded by the National Science Foundation. These figures indicate a net outmovement of half of all nonwhite persons in nonmetropolitan areas who were 15–19 years old at the beginning of the decade, and 25–29 years old in 1970 (Table 2). Further, more than two fifths of those reaching age 20–24 left, and about a third of those age 30–34. These are very high rates for such a large population dispersed over such a wide area. And they are remarkably similar to rates for the same young adult age groups in the 1950's.

The impact of these rates can be seen if they are synthesized to estimate what would happen to a cohort of rural and small town blacks exposed to them throughout the first half of their

Table 2. Estimated net migration rates of the nonwhite nonmetropolitan population of the South, by age, 1960–70 and 1950–60

Age at End of the Decade	Migration Rate* 1960–70 (Pct.)	1950–60 (Pct.)
10–14 years	—17	—18
15–19	—20	—22
20–24	—43	—43
25–29	—51	—48
30–34	—32	—37
35–39	—18	—26
40–44	—11	—18
45–49	—10	—15
50–54	— 8	—14
55–59	— 7	—13
60–64	— 5	—13

* Net migration rates represent the estimated number of migrants in an age group expressed as a percentage of the expected surviving population at the end of the respective decade.

Source: Unpublished estimates cooperatively prepared by the Rural Development Service and the University of Georgia. Data for 1960–70 are preliminary.

lives. Rates for ages under 10 are not yet available, but are likely to be about 5 percent. If 95 percent of the cohort is present at age 0–4, and is then subject to decade outmigration rates of 17 percent by age 10–14, 43 percent additional by age 20–24, and 32 percent additional by age 30–34, net outmigration equal to nearly 70 percent of the original group would have taken place by age 30–34. This, in fact, is probably very close to what has actually happened.

The difference in the pattern of net migration of blacks from the nonmetropolitan South in the 1960's as compared with the 1950's occurred primarily as a slowing down of net outmovement of persons past age 30. At each age group from 30–34 years to 60–64 years, the rate of outmovement was 5 to 8 percentage points lower in the 1960's than in the earlier decade. Net outmigration rates beyond age 45 averaged less than 10 percent for the 1960–70 decade, and no longer have major demographic impact. In contrast to the black (or nonwhite) population, net outmigration of young adult whites from the nonmetropolitan South reached a maximum of just 17 percent for persons becoming 25–29 years old—compared with 51 percent for blacks—and whites showed low but consistent inmovement beyond age 35.

In heavily agricultural areas, such as the Mississippi Delta, where rapid transformations in farming have taken place, the rates of black outmovement were much higher than the Southern nonmetro average. That part of the Delta within the state of Mississippi, for example, had net outmovement in 10 years of 67 percent of blacks who were 15 to 19 years old at the beginning of the 1960's. In most of the Delta counties, outmovement was equal to 40 percent of the entire black population.

The strength of the linkage between black population loss in the South and dependence on agriculture can be easily demonstrated. The counties of the South containing 1,000 or more nonwhites in 1960 have been grouped by the percentage of employed nonwhites who were working in agriculture, forestry, fishing, and mining. (All of these extractive activities were associated with population loss, but only agriculture employed large numbers of blacks.) Then the incidence of population gain or loss from 1960–70 was tabulated, together with aggregate population changes. The data show that the overwhelming majority (five sixths) of counties in which 20 percent or more of blacks were engaged in agriculture and other extractive industries declined in black population from 1960–70 (Table 3). Of the 68 counties in which half or more of employed blacks were so engaged, only two experienced any growth of black population, despite a large surplus of births over deaths. By contrast, the black population increased in about three fifths of the Southern counties where less than 20 percent of black workers were in agriculture at the beginning of the decade. The Pearsonian correlation between nonwhite population change and proportion employed in extractive industries was —.45. Dependence on extractive industries was by no means the only factor inducing outmigration and population loss of blacks, but it was of primary importance.

In the years following World War II, childbearing rates in the black rural population increased, even though this population was already one of relatively high fertility. In 1950, nonwhite (basically black) rural women 35–44 years old had borne an average of 375 children per hundred women in their lives to date [7]. By 1960, the figure for the comparable cohort of that year had risen to 437 children born per 100 women, and by 1970 the ratio had increased further to 476 children per 100 women [7, 4]. Some of the increase could have stemmed from selective outmigration. That is, if black women

Table 3. Nonwhite population change 1960–70 for counties grouped by percent of nonwhite workers employed in agriculture and mining 1960, for the South*

Percentage of Workers Employed in Agriculture and Mining, 1960	Number of Counties with		Population		
	Population Increase 1960–70	Population Decrease 1960–70	1970 (Thou.)	1960 (Thou.)	Percentage Change 1960–70 (Pct.)
Total	337	556	11,423	10,735	6.4
50 percent and over	2	66	669	818	−18.2
40–49	10	85	743	854	−12.9
30–39	19	111	990	1,062	− 6.8
20–29	49	109	1,225	1,265	− 3.1
Less than 20 percent	257	185	7,795	6,736	15.7

* The Census South, excluding Oklahoma.
Source: 1970 and 1960 Census of Population.

of potentially lower fertility were most likely to leave rural areas during this period, the cumulative fertility rate of rural women could have risen without any intrinsic increase in childbearing. This may be a partial explanation of the increase, but not a full one. In the postwar period black women in particular had a considerable reduction in what appears to have been involuntary childlessness, and this development alone was a major support to higher rural fertility.

As a result of the greater childbearing of the late 1940's, 1950's, and early 1960's, there are still substantial numbers of black rural and/or nonmetropolitan young adults and oncoming youth who are potential outmigrants of the 1970's. However, the combination of past heavy outmigration and a more recent trend of fertility decline has undercut the black rural age structure. By 1970, the cumulative fertility of black rural women 25–34 years old was slightly below that of women of the same age in 1960 (314 children per 100 women versus 338), and that of younger women 15–24 years old, whose childbearing is shaping the potential for future outmigration or population growth beyond 1980, had fallen far below the level for young women in 1960 (45 versus 64) [4]. The number of rural black youth under age 10 was only four fifths as high in 1970 as the number aged 10–19. Thus, there is evidence that the demographic pressure for outmovement of blacks from the rural population will diminish after the present decade.

A related feature of the rural black population —and one that has received almost no research attention—is the fact that an appreciable number of rural black children do not live with either parent. Because of high illegitimacy rates, many begin life with just one parent present. But because of the practice of leaving children behind when parents migrate, or of sending them back to live with rural relatives rather than in the city, one seventh of all rural black children under the age of 18 do not live with either parent [4]. By comparison, the comparable proportion for Mexican-American children is 1 out of 20 and for Anglos 1 out of 30. The migration of so many parents probably adds to the potential for outmigration of the parentally displaced children when they are through with school.

Mexican-Americans

There are three major Latin American minorities in the United States now—Mexican-Americans, Puerto Ricans, and Cubans—and a rapidly growing total of individually small populations from other Latin American nations. Collectively these groups numbered about 9.3 million people in 1970 [4]. But except for the Mexican-Americans, they are extraordinarily urban in residence. Ninety-eight percent of the Puerto Ricans and Cubans and 95 percent of those from Central and South America live in urban places [4]. These elements of the Spanish-American population thus have no significant representation in the rural (or nonmetropolitan) population, numbering not more than 50,000 rural people.

Persons of Mexican-American ancestry cannot be identified as such in the Census, for many of the families have been American for generations and are not picked up as completely as are the Cubans and Puerto Ricans by questions on birth place of themselves or their parents. But if one excludes from the total count of Spanish language and surname population those of Puerto Rican, Cuban, other American, Asiatic, and European parentage, the remainder are with minor exceptions Mexican-Americans. This population numbered nearly 7 million in 1970, of whom about 1,060,000, or 15 percent, were rural residents [4]. There is no comparable earlier estimate. A nonmetropolitan figure for this population is not conveniently available. It can be said that the majority of the Mexican-American nonmetro population resides in cities rather than in small towns or open country, which is opposite to the pattern of nonmetro residence by whites, Negroes, or Indians.

In 1950, when the Spanish surname technique was first used to identify Mexican-Americans in five Southwestern States, this population was already two thirds urban in those states [8]. Yet it was still more highly rural than the rest of the population in the same states (33 percent versus 28 percent). In the next two decades, the further urbanization of Mexican-Americans proceeded so rapidly that by 1970 they had become slightly more urban than the rest of the population of the Southwest. The rural Mexican-American population of the Southwest as a whole has actually increased somewhat in numbers, but most of the natural increase has been siphoned off into urbanization, as apparently has most of the immigration. However, even a partial retention of large potential increase in rural areas has resulted in a rise in the Mexican-American proportion of the total rural population of the Southwest. Mexican-Americans were about 13 percent of this population in 1950 and 16 percent of it in 1970. In this respect the situation of the Mexican-Americans in their heartland differs from that of blacks in the South, whose proportion of the rural population has steadily diminished from the magnitude of outmigration.

No specifics on the migration of Mexican-Americans and other Spanish language minorities were available before 1970. The group had not been consistently or nationally identified in racial data so that inferential net migration estimates could be computed and was not separately tabulated in the statistics on gross migration flows. Decade net migration data are still not available and will not be until two censuses with consistent levels of identification are available for comparison. But the 1970 Census does provide major advances. Persons of Spanish language background were identified nationally on a 15 percent sample basis. Even this is not perfect as a delineation of people of Latin American Spanish language ancestry, which I think is the basic population that is desired to be measured. It understates this population in some ways and overstates it in others. Thus, the data are somewhat approximate. Persons who considered themselves to be of Spanish background were also self identified on a 5 percent sample basis. Migration data from the 1965–70 period could be tabulated for either of these populations from the 1970 Public Use Sample.

Some published migration data are available from the 1970 Census. They show that the total Spanish language population has higher residential mobility than either the general white or Negro populations. Some 58 percent were living in a different house than 5 years earlier, compared with 51 percent of blacks and 53 percent of whites [4]. About two fifths of the Spanish movers had migrated to a different county in the process. This is less than the rate of intercounty moves by all whites (46 percent), but much more than the pattern for blacks, among whom only a fourth of moves were intercounty. Perhaps because of their importance in the migratory farmworker stream, the mobility of Spanish language people still in rural areas was a good bit higher than that of all whites or blacks. Although Spanish language people did not have as great a propensity as whites to make intercounty moves, they were considerably more likely when doing so to make an interregional move, even though they tend to live far from the borders of the four major regions. Thus, the Spanish language people are more likely to be living outside of the regional cultural context in which they originated.

This interregional pattern is most pronounced among the Mexican-Americans of Texas origin [6]. Large numbers of them have moved to California, to Chicago-Gary and other Midwest industrial areas, or even to the Pacific Northwest. The California Mexican-American natives, on the other hand, have tended to stay within their area of origin. For example, even though the California Mexican-Americans are less than half the distance from Oregon and Washington as are the Texans, the Texans comprise the principal source of the sizeable number who have moved to Washington and Oregon. Altogether by 1970, 20 percent of Texas-born Mexican-Americans were living in other states, with about half of this number having gone to

Table 4. Lifetime migration of Mexican-American natives of Texas and California, 1970

Born in Texas		Born in California	
State of Residence	Population (Thou.)	State of Residence	Population (Thou.)
Total	1,805.8	Total	1,310.8
Living in Texas	1,457.6	Living in California	1,247.0
Living in other states	348.2	Living in other states	63.8
California	171.8	Texas	12.0
Illinois	28.0	Arizona	9.8
Michigan	20.6	Washington	5.0
Arizona	15.3	New Mexico	4.9
New Mexico	13.0	Colorado	2.8
Washington	10.9	Nevada	2.5
Florida	10.7	Oregon	2.1
Colorado	8.6	Florida	2.0
Ohio	8.5	New York	1.7
Oklahoma	6.9	Illinois	1.6
All others	53.9	All others	19.2

Source: U. S. Census of Population: 1970, State of Birth, Subject Report PC(2)-2A.

California (Table 4). By contrast, just 5 percent of California-born Mexican-Americans had left their native state. Texas received the largest single group of these, but the net exchange between the two states was about 14 to 1 in favor of the Texas-to-California move.

As a result of the disparity in the extent to which Mexican-Americans leave Texas and California and leave their region when they do move, all of the states outside of the Southwest that have developed sizeable U. S.-born Mexican-American populations have received the largest number of their migrants from Texas, with the one exception of Wyoming. This is especially true in the Midwest, where Illinois, Ohio, Indiana, Michigan, Missouri, and Wisconsin, all now have over 50,000 native-born Spanish-language population, the majority of Mexican ancestry.

To get some measure of the migration rates of Mexican-Americans from nonmetropolitan areas, net migration data were compiled for the total population in those nonmetro counties where Spanish surname people comprised a majority of the population in 1950 and 1960, exclusive of several counties where the population change is known to have been basically non-Mexican. The net migration from such counties is predominantly Mexican in composition, but it does not represent the full extent of nonmetro-to-metro migration of this population, due to the lack of representative data from counties where Mexican-Americans are in the minority. In any event, the predominantly Mexican-American nonmetro counties showed 71,000 net outmigration from 1960–70.[1] More than four fifths of the counties had net outmigration rates of better than 20 percent for the decade—a figure that is high and generally comparable with rates for blacks from the nonmetro South. Similar data for 1950–60 show some 88,000 net outmigration from the same area [1]. Thus, there was an apparent drop in the 1960's (about 20 percent) in the amount of net outmovement from predominantly Mexican-American counties. But the essential pattern of strong outmovement remained—as it did for blacks.

A regional look at the migration data for Mexican-American counties shows that the improved retention of nonmetro population occurred in New Mexico, Colorado, and Arizona, as a group. In those states, the net outmovement was nearly cut in half in the 1960's. But, in Texas the outmovement increased both absolutely and in rate. A stepup in outmovement was also observed from the predominantly Mexican-American metro areas of the Rio Grande Valley—Laredo, McAllen, and Brownsville-Harlingen—with their heavy agricultural orientation. Despite the continued exodus from this area, the nonmetro Mexican-American population of the Southwest remains extremely young, with a median age of less than 20 years, and has high potential for further outmovement unless the economic attractiveness of South Texas, in particular, improves.

American Indians

Migration patterns of American Indians are also difficult to judge precisely from published data. In the first place, there have rarely been two successive censuses that obtained equivalent levels of Indian identification, and thus that were comparable for analysis of population change. The 1970 Census has a higher level of Indian population than is consistent with the 1960 Census. The widespread use of self-enumeration in 1970 probably improved the count of Indians, and increased Indian consciousness may have induced more people of mixed descent to list themselves as Indian. The

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[1] Preliminary unpublished estimates from cooperative work of the Rural Development Service and the Department of Sociology, University of Georgia, funded by the National Science Foundation.

Indian population reached 793,000 in 1970, an indicated growth of 51 percent over that of 524,000 in 1960 [3]. In the absence of significant immigration, such growth would require a natural increase of better than 4 percent per year, a level achievable on some of the reservations but not in the Indian population as a whole. Ratios of children to women in the Indian population suggest an average annual birth rate not above the mid-30's per 1,000. Allowance for mortality would suggest that not more than three fourths of the indicated 1960–70 population increase came from natural increase. Some of the remaining increase could reflect immigration, but most, I think, is spurious.

Thus, it is difficult to discuss Indian migration. But if the 1970 Census numbers are more valid than the lower levels of the 1960 Census, certain conclusions are available, even if not precisely quantifiable. First, we can say that the American Indian population is still the only American ethnic minority that is predominantly rural in residence, but that it is rapidly urbanizing. Fifty-five percent of Indians were rural in 1970. The 1960 figure was 72 percent, although I stress that part of the decade decline may be the product of more complete urban Indian identification in 1970. The rural Indian population had an indicated growth of 16 percent, compared with 144 percent in urban areas.

The comparatively slow growth of the rural population, during a period of improved enumeration, implies substantial outmigration to the cities. But, as opposed to the Negro population, I believe that some actual growth of the rural Indian population occurred. The existence of reservations—most of which are rural in character and location—probably insures greater retention of Indians in rural areas than would otherwise be the case. A number of the reservations and their vicinities show substantial population growth, and several counties in the Dakotas have acquired Indian majorities in the last decade.

As a result of the strong urbanward movement, a number of cities that are well removed from reservation source areas now have sizeable Indian populations [3]. The Los Angeles area has been the leading destination. There were 28,000 Indians in the Los Angeles urbanized area in 1970, with 9,200 of them in the city proper. The New York urbanized area had 11,700, San Francisco-Oakland 11,600, Chicago 8,700, Seattle 7,800, Dallas-Ft. Worth, 6,100, and Detroit 5,500. In addition, several metropolitan cities with nearby source areas had more than 5,000 Indians each—Minneapolis-St. Paul 9,600, Tulsa 9,800, Oklahoma City 10,900, and Phoenix 8,000. Some of these movements have developed without plan over time. Some had the impetus of planned relocation programs behind them. Unlike blacks, whose metropolitan urbanized populations are super-concentrated in the central cities (84 percent), only three fifths of urbanized area Indians appear to be in the central cities. Many have migrated directly to the urban fringe, in a pattern intermediate between that of blacks and whites.

Estimates have been compiled of the net outmigration of Indians from nonmetropolitan counties where they comprise the overwhelming majority of the nonwhite population and where nonwhite migration data are, thus, really Indian data. These data indicate a net outmigration of about 14 percent for the Indian population alive in 1960 and surviving to 1970. Such rates are substantial, but do not approach those commonly found for nonmetropolitan blacks.

The Indian data show nonmetropolitan outmigration heaviest in the Upper Midwest, where more than half of those reaching age 20 seem to have left. On the other hand, in Washington and Oregon a net of only a sixth of the young adults have left. Thus, conditions are variable from region to region and from tribe to tribe. And just as different major cities have drawn rural blacks from different parts of the South, major cities vary in the sources of their Indian migrants. Los Angeles is a magnet for people from many places, but has been especially attractive to the Navajo, other southwestern tribes, and to Cherokees. The Minneapolis-St. Paul Indians are heavily weighted with Chippewa and Sioux. Baltimore has been the major destination of the Lumbee and New York of the Mohawk. The various cities have Indian populations of different cultural, linguistic, and educational backgrounds, with differing degrees of homogeneity.

The current Indian rural population is extremely young in age composition—closely resembling the age structure of populations of less developed countries. Fertility is high, averaging fully five children per woman of recently completed childbearing [2]. Therefore, this population would either grow rapidly in the absence of outmigration, or give off large numbers of urban migrants (relative to the base population) in the absence of growth. The recent pattern appears to show partial population retention sufficient to result in significant local growth, plus enough outmigration to create an urban population that will comprise a majority of all Indian people by 1980.

Summary

The major American racial minorities have continued to have heavy outmigration from rural and nonmetropolitan areas in general. Blacks, Mexican-Americans, and Indians are all increasing in total numbers at a faster rate than the white population, but collectively are doing so through the growth of urban population rather than rural. In the case of blacks and Mexican-Americans, the rural-to-urban movement has continued long enough and strong enough to make them more highly urbanized than the rest of the population. Indians are still the only predominantly rural population element in the United States. The existence of so many rurally located Indian reservations probably has a retarding effect on their urbanization, but they seem on their way to becoming a predominantly urban population—with a considerable orientation toward large cities.

Each of the three populations has had the size of the outmigration stream from nonmetro areas supported by high human fertility. The number of potential outmigrants continues high in the 1970's as large cohorts of young people come of age. But among blacks, reduced childbearing among women presently of childbearing age, coupled with the age distorting effects of past migration, has lowered the number of young children to an extent that foreshadows considerable reduction in the number of young adults of school-leaving age in the 1980's. Purely economic pressures on rural outmigration have been lowered by the greatly reduced dependence on farming and other industries of declining manpower needs. But it is obvious that noneconomic forces that have a substantial momentum are also in play, and that they may sustain rural outmovement of minorities after the original forces of displacement have changed. Certainly this is dramatically evident in the case of blacks in a number of Southern areas, such as the examples referred to earlier.

Today there are for the first time meaningful numbers of urban blacks—and to a lesser extent Mexican-Americans—who are reaching voluntary retirement age in industrial or government jobs that have reasonable pension plans. Many of these people have the financial ability to return to their home areas, or to go to other rural and small town areas if they wish, in the same manner that many thousands of late middle aged and older whites have left the metropolis. There are faint signs of such movement in the 1960–70 county migration data for nonwhites, and increasing anecdotal evidence. I believe that the South and the Southwest will gradually see a return flow of successful blacks and Mexican-Americans to nonmetro areas. But I do not think it will be as relatively extensive as that of whites or that it will offset in this decade the further outmovement of younger people.

It will be interesting to see what effect, if any, the acquisition of political control of counties by blacks in the South may have on outmigration. There are a few rural counties in Alabama, Georgia, and Virginia where the black majority now has political control and is seeking to correct those aspects of local government that have disadvantaged and irritated blacks in the past. If outmigration of blacks were reduced, there are dozens of other counties that would have black political majorities. An analogous potential exists for Mexican-Americans and Indians in other regions.

Personally, I think almost every force affecting changes in the residential pattern of the U. S. population is leading to greater retention of people in the nonmetropolitan areas. The urban areas are not as urbane as they were; the rural areas are not as rustic. The displacement of extractive industry workers is nearing relative completion, and the environmental and nonmaterialistic interests of the young are supportive of nonurban residence. My suggestion is that there is an ethnocultural lag in the extension of this trend to the major racial minorities that will be highly evident in this decade, as it was in the last, but that by the 1980's the rural-urban aspects of migration will not be as divergent for these minorities compared with the rest of the population as they now are.

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The Role of the 1890 Colleges and Universities in Research on Minority Problems

T. T. WILLIAMS

IT IS ALLEGED that a dean from one of the 1862 Land Grant Colleges responded to the question, "What are the 1890 Land Grant Colleges and Tuskegee Institute doing in the areas of teaching, research, and economic development?" in the following manner. "They are graduating majors attuned to that segment of society (black, poor, and alienated) which our graduates find most difficult to relate." I propose that this image of the 1862 Land Grant College mirrors the author's criticism in the book *Hard Tomatoes, Hard Times* of the Land Grant College Complex [2].

The original sixteen 1890 institutions were founded as Land Grant Colleges with the understanding that they would develop educational programs with a rural focus for black people [4]. However, in almost all of the sixteen Southern border states where these colleges are located, they were, until most recently, the only state supported colleges for blacks. These institutions provide a multiplicity of services to black people residing in the rural and urban areas of their respective states. In fact, the history of black involvement in higher education, in general, and research, in particular, is the direct result of the 1890 Land Grant College Programs.

The broad historical responsibilities of the 1890 colleges have had major impact on higher education and economic development. For example, it is practically impossible to find a recent Ph.D. candidate in rural sociology who matriculated at one of the 1890 Land Grant Colleges [1]. On the other hand, it is encouraging to observe that in 1972 these colleges spent over 70 percent of their Public Law 89–106 research funds on human resource studies [8]. Such expenditures by these colleges in cooperation with other innovative educational outreach efforts should increase the agriculture enrollment in the technical areas, including sociology.

The 1890 Land Grant Colleges have been involved in the development and personal well-being of rural and urban black people who are educationally disadvantaged and alienated. For over 80 years these colleges have been the training centers for black leadership in this country [5]. Turn the pages of any periodical depicting black leadership in Business, Law, Engineering —you name it—and graduates from the 1890 Land Grant Colleges stand tops. Over the years the 1890 Land Grant Colleges have developed a unique kind of expertise, a proven expertise so necessary for meeting some of the social and economic problems confronting this nation. What is significant about these colleges is that they undertook these responsibilities and developed their expertise with limited state and federal support.

A recent report of the National Association of State Universities and Land Grant Colleges presents a comparative picture of funds available to 1862 and 1890 Land Grant Colleges. Of the states where two Land Grant Colleges are located (1862 and 1890), the 1862 Land Grant Colleges received $450 million in state appropriations compared to $52.3 million for the 1890 Land Grant Colleges. The disparity between the 1890 and 1862 Land Grant College is put in sharper focus when it is observed that the enrollment of the 1862 Land Grant College is five times the enrollment of the 1890 Land Grant College, yet the state appropriations to the 1862 Land Grant College is nine times that received by the 1890 Land Grant College [6].

In spite of the limited financial support made available to the 1890 Land Grant Colleges, their pattern of expenditures forecasts the allocation of scarce resources (expertise) in the correction of some of society's major social problems [3]. The allocation of Public Law 89–106 funds by the 1890 Land Grant Colleges provides this nation with an insight into the priority the administrators of the 1890 Land Grant Colleges place on ameliorative programs for the educationally disadvantaged and alienated people residing in rural America. It is estimated that approximately $12 million Public Law 89–106 funds which Congress appropriated for the fiscal year 1973 were used by the 1890 colleges to support programs in human resource development.

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Three important spin offs from Public Law funds are already obvious. (1) There is a closer professional relationship among the 1890 and 1862 Land Grant Colleges. For the first time in the history of these two institutions (1890 and 1862), they are working together from a position of respectability. This cooperative effort might be due to the fact that both receive "hard money" from Congress to operate their research and extension programs. (2) The 1890 colleges have brought into sharper focus the need for economic development and planning studies. (3) Additional state and federal resources have been committed to Human Resource Development Programs on minority problems by the 1862 Land Grant Colleges. Growing out of these spin offs from Public Law funds is a need to assign specific research roles to the 1890 and 1862 Land Grant Colleges if the impact from research expenditures is to be maximized. Neither this country nor the states wherein two Land Grant Colleges are located can ill afford to duplicate research efforts [7].

Conditions That Will Influence the Research Role of All Land Grant Colleges

There is evidence that research underway at the Land Grant Complex is designed to promote rather than retard rural migration. Attempts to increase farm production and to decrease costs have resulted in more efficient machinery and fewer people needed to produce our food supply. Members of this organization through the years have argued very convincingly that this nation has done a poor job of administering to the needs of the small, low productive farmer and/or the people displaced by machinery. On the other hand, spokesmen for the blacks and other minority groups have claimed that the interests and needs of their constituents have been neglected by the Land Grant Complex.

Regardless of the image people or groups have relative to the performance of the Land Grant Complex, it should be admitted that this institution has been successful in conducting and supporting research, developing new technology for commercial agriculture, and providing the services needed in order to utilize research findings and technology. The Land Grant Complex (1860 colleges) has a highly successful record of working with and for the educational disadvantaged and alienated people. If this nation is to overcome disparities between commercial and noncommercial agriculture, we must involve the total Land Grant Complex (1890 and 1862 institutions) in research, economic development, and planning activities. Three conditions justifying the 1890 Land Grant Colleges in research are discussed below.

First, there is a need to understand the impact of the changing characteristics of rural America on economic development. Rural America is no longer made up of farm population but a composite of nonfarm, farm, rich, and poor interests. We have witnessed the greatest migration of human resources in the history of this country. Farm population has declined to the level where some 800,000 farms produce over 90 percent of all the food and fiber. In the past 30 years, over 30 million Americans have left the countryside and 95 percent of the population of this nation live on 10 percent of the land area. It has been estimated that less than three million farmers will be needed to produce the food and fiber for our growing population. We know that farmers on the lower economic rung will be the first to depart the occupation. Where will they go? What will they do? Can we provide upward mobility where they are? What type of development programs are needed? These are just a few questions we need answer if we are to deal objectively with the situation.

Fourteen million people are being left behind in rural America—many of whom live under poverty conditions. In many cases, these are the people to whom our federal and state agricultural workers find most difficult to relate. We must develop a rural America that can bring together all the different interests for a stronger nation, and the Land Grant Complex must so allocate its proven expertise in such a manner that "people" needs are met. These colleges have the ability and responsibility to provide needed assistance to all citizenry.

Second, we can expect that farm units will become still larger, the operator more highly educated, and the demand for technical services will increase as will the need for many more personal services by the poor and alienated. Presently rural America has nearly half the nation's poverty, about 60 percent of its substandard housing, rates of unemployment and underemployment above the national average, outmigration of the young, and inadequate capital for growth and expansion. Although the economy of rural America is far from healthy, the impact of its problems is not limited to rural America. The urban area has felt the consequences of the changing pattern of rural America. We are witnessing in our cities overcrowded housing, high rates of unemployment, increased need for education, rising crime rates, congested urban communities, and more people on the welfare roll. When the trends in rural and urban America are combined, we can visualize the challenge to the Land Grant Complex (1890 and 1862 colleges) in the immediate years ahead.

From research findings at Southern University, we have been able to discern that a large number of the displaced farm people are educationally disadvantaged and alienated. We have found that they are frustrated and have destructive tendencies. They feel that society has passed them by and that they have nowhere to turn other than to the destruction of the system that allowed their needs to go unarrested and unattended. Our study findings and our experiences have lead us to conclude that unless meaningful economic programs are developed and implemented for this group, frustration and the other ills of an impersonal society will accelerate and we will witness an increase in the rate of crime in this country. Our experiences with the disadvantaged and alienated have also convinced us that this nation is moving in a pattern that will put in shadow the Harlem, Watts, and other ghetto communities near our major metropolitan cities. The people who will reside in the newly created ghetto communities will be hostile, will be mean, will be destructive, and will be most difficult to deal with. We must correct our collision course by implementing innovative programs. Research activities of the Land Grant Complex must assist in arresting this dangerous trend.

Third, there is a shift in our population from the rural to the urban sectors which continues to change the political power from rural to urban America, and we need to interpret this implication for policy formation. When the shift in political power is equated with revenue sharing, the plight of the educationally disadvantaged and the alienated takes on greater significance. Revenue sharing is real but just as real should be the understanding that only people with political power and the organizational structure to deliver that power will negotiate the system. Without such power, revenue sharing which has started to trickle down will quickly dry up.

Since the first quarter of this century, the total population of this country doubled; the rural population decreased, but the urban population tripled. During the same period, the number of black farmers decreased and the underemployed rural black males increased. The country-to-city migration left a leadership void among blacks in rural America. The development of an instrument, sophisticated and effective enough to influence program priorities for the poor and alienated, will be of primary importance for the rural and urban sectors in the immediate years ahead. We must look to our Land Grant Colleges to assume a major role in the development of such a community-based action instrument.

The Role of the 1890 Land Grant Colleges in Research

If this nation is to deal effectively with the three problem areas cited above, there is an urgent need to develop and implement innovative economic development and planning programs based upon research experience and unique expertise located at the 1890 Land Grant Colleges. Many of the 1890 Land Grant Colleges are engaged in research and outreach activities designed to help people outside the mainstream of society. The rationale for such programs and activities at these colleges is based on the thesis that there is still a need for alternative economic opportunities within the community where the poor and alienated people reside rather than their having to be forced to move to congested urban centers. We know from experience that many of the problems of the congested urban cities, such as alienation, poverty, and drugs, have their roots in rural America and should be attacked at the rural level. We are convinced that unless meaningful programs can be implemented the poor and the alienated people presently residing in the rural areas will migrate to congested cities at an increasing rate. Likewise, unless the people residing in rural areas are provided with alternatives for upward mobility, the present social and economic ills of our cities will become more intensified and difficult to solve.

Research is necessary on such topics as economic development and legislation inhibiting these endeavors. Research can help determine the success or failure of development. Economic development can succeed if our Land Grant Complex will blend resources and expertise to meet the needs of all citizenry. People with limited physical and financial resources have had to get their research information for economic development and planning the best way they could. Usually the best way was no way or by trial and error. The upshot of all of this is that we have committed large sums of research funds in planning for commercial agriculture and a relatively small amount of research funds to the solution of "people problems." Implicit in this observation is the recognition that research geared to the small farmer and the alienated and with "now" application is seriously needed. Again, the 1890 Land Grant Colleges have the experience to assume this responsibility.

We must admit that our approach in planning for the relatively small farmer and the disadvantaged has not been effective. Published and unpublished statistical data are telling us this if only we would be objective about interpreting the information. The lack of involvement of the 1890 Land Grant Colleges in the development and the implementation of meaningful research thrust in the areas of economic development and planning comes through these data very sharply. It is no accident that there are more people living under poverty conditions today than there were when the poverty war was declared. But to admit this would open up for question what America has been saying it is all about—a nation that has won every war it has been involved in except the poverty war.

People in position of leadership should be guided by the fact that the research delivery system must aid those people left behind. Just as important is that people in policy roles must base their decisions on the concept that the deprived group must have an understanding of the American System and how that system operates. I am convinced that when people are brought into the system and permitted to share in its good qualities, they will protect and defend that system.

Leadership research designed to provide facts so necessary for making the proper decisions where the plight of the poor and alienated is concerned is badly needed by policymakers. The migration of people from rural areas has affected the leadership structure and leadership competence in rural America. Rural leaders with the ability and the initiative have moved elsewhere in search of a better life. Those leaders who have emerged to fill the vacuum are experiencing difficulty in moving the people and the community forward. Who are the Indigenous Rural Leaders? Where are they located? What are the specific deficiencies in their leadership abilities? How can available resources be allocated to meet the needs of these people? These are answers which policymakers must have if they are to carry out their responsibilities properly. Expertise located at the 1890 Land Grant Colleges is attuned to leadership research and when adequately funded will provide policymakers with such answers.

Research is needed on factors inhibiting the acceptance of improved practices. From *experience,* personnel at the 1890 Land Grant Colleges know that it is most difficult for people to develop the ability and self-reliance to perform leadership roles without support from outside the community. This is particularly the case where the educationally disadvantaged and alienated people are concerned. The 1890 college personnel also know from *experience* that the failure of low income people to utilize fully the many services that are available to them is not a reflection on the poor or alienated but the inability of the established service agencies to gain the support of low-income people. The inability of sponsoring agencies to gain acceptance supports the need for researching the traditional approach to community and economic development by the Land Grant College Complex.

The 1890 Land Grant Colleges have traditionally drawn their clientele (students) from homes with low family incomes. A casual review of what the graduates are doing by way of employment reveals the success of these colleges in this effort. The 1862 Land Grant Colleges have found it easy to respond to the demands for sophisticated research relating to the problem of commercial agriculture, and, presumably, the Land Grant Complex has been quite effective in meeting the demands of its clientele in that America is the most affluent society in the world. Through research, resulting in technological progress, one farmer is able to feed himself and 50 other individuals. Through mechanization we have reduced the time necessary to produce the food basket, but in the process of all of these advancements we have placed on the welfare roles an increasing number of our citizens. There must be alternatives—alternatives that will place emphasis on "people" rather than "things," alternatives that will not diminish the thrust of research to commercial agriculture but increase the importance of research dealing with the problems of the poor and the alienated. The 1890 Land Grant Colleges must be involved in this major task.

I am aware that what is being proposed here is not an easy task since the traditional research establishment with relatively large financial support is least prepared to deal with the problems of the poor and the alienated or to share that role with others. But, I am just as convinced that an enlightened people will rise to the occasion; and, it is because of this that I am confident that the role of the 1890 Land Grant College will surface. The 1890 Land Grant Colleges in addition to dealing with economic development have the know-how and track record for researching the problems of the disadvantaged and the alienated. These colleges have historically undertaken these responsibilities with limited state and federal appropriations with the proficiency that few people would refute. Now these colleges are in need of adequate funding to carry out what they have proven they can accomplish.

Effective economic development programs and planning designed to help the educationally disadvantaged and alienated must be based upon understanding of the target population and reliable data concerning the people to be served. The researchers of the 1890 Land Grant Colleges have that understanding, sensitivity, and research expertise to compile and analyze data concerning this and other segments of our society. Federal and state officials should publicly recognize the research expertise located at the 1890 Land Grant Colleges and adequately fund these colleges to assume a specific role. The officials must admit that there is a need for technical assistance (research findings) to guide and direct economic development policies. At the present time the technical base required to support meaningful economic development and planning for the disadvantaged and alienated is still to be created—from research still to be undertaken and by institutions still to be named. Yet the merit of assigning a specific research role to the 1890 Land Grant Colleges and Tuskegee Institute has been historically documented. We must commit adequate resources to such a responsibility if we are to utilize the reservoir of expertise located at the 1890 Land Grant Colleges in this effort.

Unless this nation sincerely commits itself to the elimination of all inhibitors of economic development and unless our resources are fully utilized to help the educationally disadvantaged and alienated, the Christian underpinnings of this nation will be destroyed. The plight of the neglected people will stand as a memorial to what an enlightened society let happen to the most affluent people in the world—we will not let this happen.

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Traditional Graduate Admission Standards as Constraints to Increasing the Supply of Black Professional Agriculturalists: The Florida Experience*

CARLTON G. DAVIS

THIS PAPER examines traditional graduate admission standards as they might affect the supply of black professionals in agriculture and related areas. The following objectives will be pursued:

1. Review the demand and supply conditions for black agricultural graduates, particularly at the graduate level.
2. Examine black graduate enrollment in the South and traditional Land Grant admission standards.
3. Review the University of Florida experience in black graduate enrollment and its experimental graduate program in agriculture for black Americans.
4. Integrate the Florida experience into a policy framework for positive and affirmative action in the area of increasing the responsiveness of the Land Grant System to the crucial need of advanced training for blacks in the agricultural sciences.

Demand and Supply Conditions for Black Professional Agriculturalists

Insights are provided into demand and supply conditions for black professional agriculturalists by the following observation:

> Excellent employment opportunities exist for black graduates with advanced degrees in agriculture and related sciences. These opportunities exist in both the private and public sectors. The U. S. Department of Agriculture, for example, has some very extensive recruiting efforts underway to try to encourage black Americans to prepare for careers in this agency. Great difficulty has been experienced, however, in securing suitably trained personnel for such employment. Professional employment in agriculture and related fields requires a level of formal training that few negroes can currently meet [18, p. 1].

Current job requirements increasingly demand a graduate degree for employment in almost all areas of agricultural sciences.[1] The drastic shortage of black agricultural graduates with advanced training, in relation to the growing demand, was recently discussed at a conference of the 1890 and 1862 Land Grant Colleges and other organizations concerned with agricultural research and extension programs in the Southern region [10].[2]

Task forces were formed to review the manpower and resource requirements for improving research and extension programs in the region, particularly as related to the 1890 Land Grant Colleges. The task forces proposed the following high priority areas in which the Southern Regional Education Board (SREB) could assist the 1862 and 1890 institutions in developing a unified program.

Extension Related Proposals:

1. Determine the feasibility of designing a graduate program in a Land Grant University of the South which would serve as a special center for advanced education of black professionals in agriculture.
2. Eliminate or reduce residency requirements and out-of-state fees for professionals, especially blacks pursuing advanced degrees in agriculture at Land Grant Universities in the South.
3. Secure additional financial support for inservice black professionals who are pursuing advanced degrees.
4. Bring to the attention of responsible bodies the need for increasing the number of black professionals in agriculture.

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* The author is greatly indebted to M. A. Brooker, Director, Academic Development Program, Leo Polopolus, W. W. McPherson, M. R. Langham, F. J. Prochaska, and K. R. Tefertiller for providing valuable insights. The author, however, is solely responsible for the contents of the paper.

Florida Agricultural Experiment Station Journal Series No. 4973.

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[1] The professional agricultural economist increasingly needs a Ph.D. degree. The same is true for professional agronomists, agricultural engineers, and animal scientists.

[2] Leadership of the conference was taken by the Southern Regional Education Board. However, SREB took the leadership role on the recommendation of the Council of Higher Education in Agricultural Sciences.

Research Related Proposals:

1. Encourage 1890 institutions to appoint agricultural administrators with research interests broader than "hard core" or "production oriented" agriculture. This orientation would provide greater cooperative problem-solving research between development, human nutrition, and the behavioral sciences.
2. Develop interregional and intrastate exchange programs for research personnel between the 1890 and 1862 institutions.
3. Assess continually the future manpower needs of the 1890 institutions. Assessment to be made by the Southern Regional Education Board.
4. Encourage 1890 and 1862 institutions to establish balanced state programs of research in "people problems" and basic agriculture.
5. Identify programs of excellence at Southern Land Grant institutions and encourage talented black students to pursue graduate studies at these institutions.
6. Make a strong regional effort in at least one state to develop a cooperative program involving 1890 and 1862 institutions to expand graduate training as a means of ameliorating the shortage of high level agricultural manpower.

Factor Demand:

Increased demand for the services of black agriculturalists, particularly at the post-baccalaureate level, can be explained by traditional economic theory. According to factor demand theory, the marginal value productivity of a factor defines its demand. Factor demand is in turn "derived" from the demand for the product. In the case of black professional agriculturalists the product takes the form of problem-solving research competence; effective teaching and extension related activities; and administrative and consultative functions. Demand for such professionals with advanced college training has shifted upward and to the right. Expansion in demand is attributed to an increase in the marginal productivity of the factor as a result of more highly qualified black agriculturalists and an increase in demand for the services performed by black agriculturalists. The latter is mostly due to the desire to achieve equity between black and white professionals.[3]

A number of institutional factors are associated with the increased demand for black agricultural graduates with advanced training. One major factor is the opening up of employment opportunities in the agribusiness sectors of private industry via equal employment opportunity policies. There is also increasing demand for such professionals by private and public agencies involved in agricultural development work in the less developed countries. One of the most significant components of the expanded demand is of relatively recent origin. This demand component is the increased manpower requirement of the 1890 Land Grant Colleges as a result of increased appropriations. Approximately 12.6 million dollars were made available to the 1890 institutions beginning in 1971 to cooperate with USDA and state experiment stations in ". . . research to help solve the nation's rural and agricultural problems" [11]. Increased funding probably marks the first time in the history of these institutions that genuine attempts have been made to provide resources necessary for high quality research and extension programs [3, 8].

The new cooperative venture of the 1890 and 1862 institutions is probably an outgrowth of the growing awareness that there is an uneven exertion in aggregate demand, over time and across demographic classes. Relative changes in black-white rural poverty status over the decade of the 1960's illustrate this tendency. Over the decade significant reduction was recorded in the number of poor persons living on farms. In spite of these dramatic movements by rural households across the poverty threshold, there were no major changes in the poverty status of rural poor blacks by the end of the decade [7]. Massive migration of blacks out of the Southern states took place during the 1960's at an estimated annual rate of 140,000. This amounted to 1.4 million for the decade [5, 7].

Changes taking place in Southern rural communities have accelerated adjustment problems for blacks. A unified program of attack by the 1890 and 1862 institutions is increasingly important for solving these adjustment problems. New cooperative efforts of the 1890 and 1862 institutions have not been without controversy. Much of the controversy is concerned with historical disparities in the funds allocated to the two groups of institutions [5, 8]. The relatively small pool of black agriculturalists with advanced degrees is related to some aspects of the controversy. More important aspects are exclusion of blacks from predominantly white Southern institutions with graduate programs;

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[3] A more comprehensive discussion of the demand component can be found in [2].

inadequate undergraduate preparation, at 1890 institutions for success in Graduate Schools; and limited financial support to blacks in the form of scholarships, grants, assistantships, and other financial support.

The net effect of the multiplicity of forces mitigating against advanced training for black agriculturalists is substantial. Estimates indicate that between 1920 and 1962 a total of 53 Ph.D. degrees (1.03 percent) were awarded to blacks in the agricultural sciences in a total of 5,122 such degrees awarded in the United States. The majority of the degrees received by blacks were from Northern institutions, in spite of the fact that the sixteen 1890 Land Grant Colleges are located in Southern and Border states [2].

Black Graduate Enrollment in the South and Traditional Land Grant Admission Standards

As late as the 1950's graduate professional education for blacks was almost nonexistent in the South. None of the predominantly black Southern institutions offered a program leading to the Ph.D. degree. Two predominantly black institutions supplied four fifths of the nation's black medical doctors and dentists.[4] In contrast, an estimated 32 Southern white universities had degree programs in medicine, 33 in law, and 34 in engineering [2]. Limited graduate opportunity for blacks is brought into sharp focus considering the fact that over the same period, 114 of a total 118 black institutions were located in the South. These institutions matriculated 85 percent of all Southern black undergraduates. In 1920 were recorded the first five master's degrees awarded by black institutions. By 1950 the number had increased to 768 with 50 percent going to females. However, the majority of the awards were in education [3]. Only in recent years has a limited Ph.D. program in some fields been developed at predominantly black institutions.[5] Advanced degree programs are virtually nonexistent in agricultural sciences [3, 6]. Assuming that the 53 Ph.D. awards to blacks in agricultural sciences over the 1920–62 period went to graduates of black colleges, only 3.6 percent of all doctorate degrees awarded to graduates of such colleges were in the agricultural sciences.[6]

In reviewing traditional post-baccalaureate admissions policy for blacks within the Land Grant System, the policies of Southern institutions necessarily become a focal point. To begin with, in spite of massive migration of Southern blacks to Northern cities, 50 percent of the nation's blacks still reside in the South. Second, the majority of the estimated 328,000 black farmers and farm workers are located in the South. Third, all of the 1890 Land Grant institutions are located in Southern and Border states. Finally, historically the majority of advanced degrees awarded to blacks in the agricultural sciences have been from institutions outside of the South.

The Land Grant System with its teaching, research, and extension components has been a major source of our increased agricultural productivity and economic growth. The Land Grant System, however, has exerted an uneven influence on the social and economic well-being of black and white Americans. This unevenness is even more pronounced in the South where, historically, institutional barriers have tended to exclude blacks from the full benefits of a wide range of subject matter disciplines and quality education.[7] In the fall of 1970 black American graduate enrollment at the 16 Southern and Border State 1862 Land Grant institutions represented 2.67 percent of total graduate enrollment. Black American enrollment as a proportion of total enrollment was only 2.56 percent [12].

Progress has been made in opening up opportunities for quality education to blacks at Southern Land Grant institutions as well as at other institutions. However, a substantial number of institutional barriers still remain to the full participation of blacks in Southern higher education. Under court litigation and civil rights legislation, the incidence of outright exclusion of blacks from institutions of higher education has diminished. The net effect of this trend for major increases in black graduate enrollment at Southern Land Grant institutions is not clear. There is growing concern that potential increases in graduate enrollment via reduced racial barriers might be offset by exclusion through traditional graduate admissions policies and standards. Traditional graduate admissions policies tend to function as effective barriers to increased graduate enrollment of blacks. Generally, admission criteria favor those students who are more adept in tests of traditional design. In most cases such students are white, since very few blacks are able to compete effectively on the more traditional testing procedures. The generally poorer performance of blacks is related to a number of socioeconomic factors. These factors are well documented elsewhere [4, 9] and have provided the major thrust for compensatory testing and admission procedures for disadvantaged blacks. However, many Southern institutions have been reluctant to explore nontraditional graduate admission criteria for black applicants. Flexible graduate admission standards for blacks have been viewed as an effective lowering of graduate standards.

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[4] Of all black state colleges plus 32 private black colleges supported by the United Negro College Fund, only two trained medical doctors and dentists—Howard University in Washington, D. C., and Meharry Medical College in Nashville, Tennessee.

[5] Mainly at Howard and Atlanta Universities.

[6] This is not an unrealistic assumption, since a large proportion of blacks with advance degrees received their undergraduate training at black institutions.

[7] Prior to the Supreme Court Desegregation Decision of 1954, many Southern states had laws that barred blacks from attending white educational institutions.

The University of Florida Experience

Enrollment and degree awards

Between the 1966-67 and the 1970-71 academic years, the number of advanced degrees awarded to black Americans through the Graduate School at the University of Florida was less than 1 percent of all master's degrees and doctorates awarded.[8] Since 1970 the number of awards going to blacks has significantly increased, particularly at the master's and specialist levels. Master's degrees awarded blacks increased from .71 percent in 1969-70, to 4.19 percent of all such degrees awarded in 1972-73. For the same period, there was an increase from zero to 20 percent for specialist degrees and zero to 1.71 percent for doctorates. Of the 10 doctorate degrees conferred on blacks up to the 1971-72 period, one such degree was a Ph.D. The remaining nine degrees were Ed.D's, a fact which suggests tendency for concentration of doctoral awards in the field of education [16].

The increase in the number of master's and specialist degrees awarded to blacks, particularly the doubling of master's awards between 1970-71 and 1971-72, reflects to a great extent the impact of the experimental Academic Development Program for black Americans (ADP) within the College of Agriculture. Almost 27 percent (13 of 47) of the master's degrees awarded to blacks over the 1971-72 period were in the agricultural sciences and related areas. Furthermore, all of the agricultural degree recipients entered the Graduate School through the ADP program. Approximately 16 percent of the master's degrees awarded in 1972-73 went to ADP participants. Although official records were not available on the number of black American recipients of agricultural degrees prior to 1971-72, available evidence suggests that the numbers were insignificant in relation to the total number of awards in this area. Black American enrollment averaged only 1.66 percent of total enrollment over the 1970-71 academic year. Black American enrollment as a percentage of total Graduate School enrollment was 2.66, 3.69, and 3.94, for 1971-72, fall of 1972-73, and winter of 1972-73, respectively [16].[9]

Traditional graduate admission standards and black enrollment

The potential impact of traditional graduate admission standards on black enrollment can be assessed in terms of the relationship of such standards to the black academic experience. Unqualified admission to full graduate status at the University of Florida is based on the following credentials, according to *official* University standards [15, 20, 21]:

1. An undergraduate degree from an accredited college with a B (3.0 of possible 4.0) average or better for the last two years of the undergraduate program. In some units, an undergraduate Grade Point Average (GPA) considerably above a B average is required for acceptance to more advanced work.
2. An acceptable distribution and quality of undergraduate work, as well as the level of undergraduate preparation for the specific graduate program desired.
3. A Graduate Record Examination (GRE) score of at least 1,000 (500 average) on the verbal and quantitative portions of the General Aptitude Test. In addition, scores are required by several departments on one or more advanced subject matter tests of the GRE.

In reality, however, three different admission standards operate simultaneously at the graduate level [15]:

1. An *official* University requirement of at least a B average during the last two years of undergraduate work *and* at least 1,000 points on the GRE (500 average).

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[8] Records were not available for awards prior to 1966. Florida's experience in minority recruitment probably overstates the progress made in minority recruitment at many Southern Land Grant institutions since 1970. Florida has committed itself to an affirmative action program and has vigorously pursued its minority recruitment programs.

[9] For the fall term of 1972-73, black Graduate School enrollment was approximately 21 percent of total black enrollment at the University, i.e., 140 of some 680 black students.

2. A Board of Regents (BOR) requirement of at least 1,000 points on the GRE *or* a B average for the last two years of undergraduate work (with a 10 percent exemption clause).

3. A "flexible" University standard which permits the admission of students who possess neither a B average in their last two years of undergraduate work nor 1,000 points on the GRE.

The 10 percent Board of Regents exemption clause has been the basis of flexibility in University admissions policies. However, the majority of the students admitted under the exemption clause have tended to be white and foreign (including black aliens) rather than black Americans.

Actual graduate admission experience of the University has departed significantly from *official* admission standards. However, increased flexibility in admission standards has not (with the possible exception of the Colleges of Agriculture and Education) been extended to black American applicants by the various colleges. Academic departments can request that records of applicants with lower than a B Grade Point Average and/or 1,000 GRE score be forwarded from the Admission's Office for evaluation. Many black applicants' records fall into this category. In fact, very few departments have made such requests in relation to black applicants. The net effect is that the policy of the Admission's Office in only forwarding to the various colleges those applicants' records with a GRE score of 850 (425 average) has effectively lowered the probability of a substantial number of black applicants' records reaching specific departments for evaluation.[10] Relatively few blacks actually qualify for admission by meeting the official University standards or the Board of Regents standards.[11] More flexible admission standards have not significantly affected the total number of black enrollees, largely as a result of the limitations on flexibility imposed by the 10 percent Board of Regents ceiling and the relatively small number of organized programs available for black applicants within the flexible standards.

In addition to the constraint imposed by traditional graduate admission standards to increased black enrollment, an additional constraint is in the form of limited financial assistance for disadvantaged blacks. Many academic departments require considerably higher test scores than the 1,000 GRE score to qualify for departmental financial assistantships.

Assessment of the experimental graduate program in agriculture for black Americans

Background and objectives of the program. —In 1969 the Institute of Food and Agricultural Sciences (IFAS) of the University of Florida initiated a unique experimental graduate program in agriculture for black Americans.[12] The program's major objectives are increasing the level of professional training available, as well as the supply of black agriculturalists, and making the educational and financial resources of the 1862 Land Grant System more relevant to the black educational experience.

Acting upon a proposal submitted by IFAS to the Rockefeller Foundation in December of 1968 [18], the Foundation made an initial commitment of $261,750 to the program over a three year period (1969–72);[13] this pledge was matched by IFAS resources of an additional $243,900. The Rockefeller commitment was subsequently extended by an additional $184,700 to cover the 1972–74 period. Upon receipt of the additional support an additional $339,000 was earmarked by IFAS to carry the program to its termination date. Thus, the joint Foundation-University financial commitment amounted to over one million dollars.

The underlying philosophy of the Florida

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[10] Efforts have been made by some academic departments to encourage minority enrollees by developing well-planned schedules of testing and counseling. The Graduate Council of the University encourages such programs [14, 17]. However, few departments have organized programs. The College of Agriculture has gone further than any other college in establishing formal admission channels with adequate supporting resources for processing black applicants. By request, beginning in 1971, all minority applicants' records are forwarded to the College for evaluation, regardless of GRE scores.

[11] It is possible that those blacks who could meet these standards chose to seek admission to the more prestigious "Ivy League" schools or to the major Northern institutions, where special financial aid packages are available for blacks.

[12] The Institute of Food and Agricultural Sciences (IFAS) is the agricultural component of the University of Florida. IFAS has statewide responsibilities in agricultural research, extension, and education. The unit includes the College of Agriculture, the Agricultural Experiment Stations, the Agricultural Extension Service, and the School of Forest Resources and Conservation. The unit is coordinated by a Vice President for Agricultural Affairs.

[13] The initial proposal for this program was prepared for the discipline of Agricultural Economics. However, prior to submission to the Rockefeller Foundation, the proposal was revised to include all other disciplines in agriculture.

"Academic Development Program in Agriculture and Related Fields for Black Americans" (ADP) is probably best expressed by the following statement in the proposal:

> Efforts to attract qualified Negro applicants for graduate work have been unsuccessful. Requirements for admission to graduate work—particularly with financial assistance—are increasing at a rate that exceeds the increase in the quality of undergraduate work in most colleges attended by the vast majority of black students. Funds are not currently available to help support the black student who must take remedial or background work to become qualified for admission to graduate studies. Funds are being requested of the Rockefeller Foundation to meet a portion of the cost of a program described herein, aimed at dealing with this problem [18, p. 1].

Features of the program.—Three major features of the Florida Academic Development Program (hereafter referred to as the ADP) set the tone for the unique and nontraditional aspects of the program:

1. The establishment of a special program of study to prepare black Americans at the post-baccalaureate level to enter graduate programs in agriculture and related fields.
2. The provision of financial assistance to black participants with bachelor's degrees while they are engaged in preparatory work for Graduate School.
3. Guaranteed financial assistance to participants who successfully gain admission to the Graduate School.

Financial support for the recruitment and preparatory phases of the program is met through the Rockefeller Foundation grant. Students are recruited throughout the South by correspondence and follow-up visits by the director of the program. Recruitment is largely confined to predominantly black colleges. Prospective participants are selected on the basis of undergraduate academic performance, motivation for graduate work, and letters of recommendation from faculty with whom they have worked. Applicants are then assigned to specific academic departments on the basis of their requests for subject matter areas. Each academic department has an official coordinator. If the applicant is accepted, the departmental coordinator serves as academic advisor to the student for the duration of the preparatory work (one to three quarters with the possibility of an additional quarter if it can be justified).

The academic performance of each student is closely monitored, and academic tutors are provided in subject matter areas where students are experiencing academic difficulties. As required by University policy, students must submit GRE scores for the General Aptitude Test, which is administered by the Educational Testing Service, Princeton, New Jersey. In conformity with University and Board of Regents regulations, ADP participants are required to take the GRE examination, either before entering the program or within two quarters of entering the program. An important nontraditional feature of the program, however, is the fact that a student's admission to Graduate School is based largely on the student's academic performance during his preparatory work, regardless of his GRE scores. Students are paid a monthly stipend during their preparatory work.

Upon completion of the preparatory program and successful entry into Graduate School, participants are automatically awarded financial assistance from IFAS resources. Such assistantship funds are earmarked specifically for this purpose.[14] Thus, the student is not forced to compete with nonminority students for regular departmental assistantships. Generally, competition for departmental funds is extremely keen and award criteria are high.

The remaining portions of the paper review the performance of ADP participants for 14 academic terms (three and one half academic years).

Performance of ADP participants (1969–70 academic year).—Table 1 summarizes the data on participants who entered the program during its first year. The table gives comparative data for three participant categories: all students in the program, successful students (defined as those gaining entry into Graduate School), and unsuccessful students.[15] A total of 16 students, representing 10 different predominantly black

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[14] Currently the participants in the preparatory phase of the ADP are paid a stipend of $290 per month plus out-of-state fee waiver (an additional $350 per quarter). Assistantship stipend is $315 per month. All assistantships are on a year-round basis.

[15] Defining "successful students" as those who have gained entry into Graduate School results in certain instances where students are actually attending the University in the preparatory phase of the program but are classified as unsuccessful. Thus, the classification "unsuccessful," does not mean in all instances that the participant is no longer in the program, nor does it mean, necessarily, that the investment was not economically and socially worthwhile.

Table 1. Academic performance of black academic development students, University of Florida, academic year, 1969-70

Variable	Admitted Students	Institutions Represented	Undergrad. GPA Last 2 Years	GRE Scores Verb.	GRE Scores Quant.	GRE Scores Avg.	Students Presenting Scores
			Number of Successful Students				
Sub-total	13	9	37.01	4580	5040	4810	13
Average	—	—	2.85	352	388	370	—
Range	—	—	2.26-3.54	220-490	240-530	230-480	—
Standard deviation	—	—	.42	78.44	81.26	73.54	—
Coefficient of variation	—	—	.148	.223	.210	.199	—
			Number of Unsuccessful Students				
Sub-total	3	3	8.86	900	950	925	3
Average	—	—	2.95	300	317	308	—
Range	—	—	2.80-3.13	240-330	300-330	270-330	—
Standard deviation	—	—	.17	51.96	15.28	33.29	—
Coefficient of variation	—	—	.056	.173	.048	.108	—
			All Students				
Grand total	16[a]	10	45.87	5480	5990	5735	16
Average	—	—	2.87	342	374	358	—
Range	—	—	2.26-3.54	220-490	240-530	230-480	—
Standard deviation	—	—	.38	75.70	78.31	71.36	—
Coefficient of variation	—	—	.134	.221	.209	.199	—

[a] Over the 1969-70 period four students accepted in the program chose not to attend.
Source: [19].

institutions in the South, entered the program during the first year. The average undergraduate GPA of the group was 2.87 of a possible 4.0. All students presented GRE scores on the General Aptitude Test. The average scores for all students were 342 and 374 on the verbal and quantitative portions, respectively, and an overall average score of 358 for both sections. Thirteen of the 16 participants can be classified as "successful" in that they succeeded in gaining entry into Graduate School. This represents a "success factor" of 81 percent. Of significance is the fact that all successful participants went on to receive master's degrees in nine different academic disciplines.[16] The three unsuccessful participants became ineligible for continuation because of inadequate academic progress.

The overall average GRE score for the successful participants was 62 points greater than that of the unsuccessful participants. No statistically significant differences were found in the mean scores of successful and unsuccessful students with respect to GPA, verbal, quantitative, or average GRE scores. Of importance from a policy standpoint are: (a) none of the 16 participants admitted to the ADP over the 1969–

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[16] Academic degrees were distributed as follows: Agricultural Economics, Animal Science, Agronomy, Business Administration, two each; Entomology, Vegetable Crops, Microbiology, Political Science, and Veterinary Science, one each. Participants receiving degrees in Business Administration and Political Science were those who chose a transfer to other disciplines after entering the Graduate School. Transfers are not eligible for assistantships from IFAS resources. Generally they were awarded financial assistance from their respective academic departments.

Table 1. (Continued)

Variable	Terms Before Admission to Grad. School				Master's Degree Recd. or Expected		Terminated		Current Status		
	1	2	3	4	Recd.	Exp.	Academic Reasons	Other Reasons	Employ.	Grad. School	Not Known
Number of Successful Students											
Sub-total	—	1	10	2	13	—	—	—	11	2	—
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
Number of Unsuccessful Students											
Sub-total	—	—	—	—	—	—	3	—	—	—	3
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
All Students											
Grand total	—	1	10	2	13	—	3	—	11	2	3
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—

70 period could have met the 1,000 (500 average) GRE criterion, and (b) only 19 percent (3 students) would have had their application forwarded to the College of Agriculture for admission consideration under the 850 (425 average) GRE policy of the Admission's Office in the absence of a special College program.

The significance of the above findings can be further illustrated by a review of the data presented in Table 2. The average GPA of ADP applicants was lower than the average for the College of Agriculture. It was considerably lower than the University average. The most dramatic differential, however, is with respect to GRE scores. ADP applicants averaged 167 points lower on both portions of the GRE than applicants in the College of Agriculture and 220 points lower than the overall average of University applicants. Interestingly, the rejection rate for the ADP applicants into the University was 9 percent, compared to 39 percent and 24 percent for the University and the College of Agriculture, respectively.[17] This relatively low rejection rate emphasizes the importance of having organized and well established admission mechanisms for handling applications from economically and educationally disadvantaged groups.

Of the 13 degree recipients, 11 are currently employed in a wide range of professional activities. A relatively large number are currently employed in the 1890 Land Grant institutions as extension subject-matter specialists. Two degree recipients are currently working toward Ph.D. degrees in their respective fields.

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[17] Denial rates for ADP participants are with respect to admission to the University while University and College of Agriculture rates are with respect to the Graduate School. ADP denial rates to Graduate School are low, since academic departments do not recommend an applicant's admission to Graduate School unless they have agreed to accept the applicant.

Table 2. Undergraduate grade point average and GRE scores comparisons, University of Florida Colleges, College of Agriculture and Academic Development Program, Academic Year, 1969-1970

Unit	Average Undergraduate GPA, Last Two Years, Domestic Students	Average GRE Score Domestic Students (Total)	(Average)	Applications Denied (Percent)
University[a,b]	3.04	1156	578	39.0
College of Agriculture[a]	2.90	1050	525	23.8
Academic Development Program[c]	2.84	716	358	9.1[d]

[a] Based on averages of students whose applications were accepted.

[b] Includes 13 Upper Division Colleges, excluding Dentistry and Law.

[c] GPA based on averages of all students whose applications were accepted. GRE scores are based on averages of those students presenting scores. Over the 1969-1970 period, all applicants accepted presented GPA's while GRE scores are for 80 percent of those accepted to the program.

[d] Two of a total of 22 applicants. It should be noted that the denial rate for ADP participants is with respect to entry into the University, and not into Graduate School as is the case for the University and College of Agriculture figures. The actual percentage of ADP applicants denied admission to the Graduate School should be low. Academic Departments would not support participants' applications unless the department has agreed to accept the student as a regular graduate student.

Sources: [13, 19].

Performance of ADP participants (1970–71 academic year).—Table 3 summarizes performance data for the 21 ADP participants admitted during the 1970–71 academic year. Participants represented 15 different black institutions, and all participants presented undergraduate GPA's, while GRE scores were presented by 95 percent (20) of the students.

Twelve students succeeded in gaining entry into Graduate School. This represents a 57 percent success factor for that class. This percentage does not compare favorably with the 81 percent for the class of 1969–70. The relatively poor performance of 1970–71 participants can be largely attributed to nonacademic factors. Of nine unsuccessful participants only one student was terminated for academic reasons. Eight (89 percent) of the unsuccessful students were terminated for reasons other than academic failure.[18] No statistically significant differences were found in the mean scores of the successful and unsuccessful participants.

Four of 12 successful students have received master's degrees and 7 are expecting such degrees within a relatively short period.[19] Of the 12 students, 2 (17 percent) could have gained admission to the Graduate School by meeting the 1,000 (500 average) GRE requirement. Only 4 of 20 students presenting GRE scores (20 percent) and 3 of the 12 successful students (25 percent) would have had their applications forwarded to the College of Agriculture for departmental review in the absence of a special College program.

Table 4 documents the noncompetitive admission status of ADP applicants. Applicants did not compare favorably with University and College of Agriculture applicants on either GPA or GRE scores. ADP applicants averaged .29 and .18 percentage points lower than the average GPA of University and College of Agriculture applicants, respectively. ADP applicants average GRE scores were 216 and 182 points lower than the average of the University and the College of Agriculture, respectively. The relatively low denial rate of ADP participants to the University again dramatizes the impact of a special program for disadvantaged blacks.

Performance of ADP participants (1971–72 academic year).—Performance data for the 17 ADP participants for 1971–72 is given in Table 5. The overall GPA of the group was 2.71 compared to 2.70 and 2.72 for the successful and the unsuccessful participants, respectively. The overall average GRE score for the group was 320, compared to 322 and 316 for the successful and unsuccessful groups, respectively. There were no statistically significant differences in the mean

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[18] Five of the eight unsuccessful students withdrew from the University in the spring of 1971 in sympathy with the Black Student Union's (BSU's) position in its conflict with the administration.

[19] Degrees awarded were one each in Soil Science, Dairy Science, Extension Education, and Agricultural Education. Seven students are listed as expecting master's degrees rather than eight as a result of the withdrawal of one of the successful students. The four degree recipients are currently employed within the 1890 Land Grant System.

Table 3. Academic performance of black academic development students, University of Florida, academic year, 1970-71

				GRE Scores			
Variable	Admitted Students	Institutions Represented	Undergrad. GPA Last 2 Years	Verb.	Quant.	Avg.	Students Presenting Scores
			Number of Successful Students				
Sub-total	12	8	31.77	4360	4670	4515	12
Average	—	—	2.65	363	389	376	—
Range	—	—	2.06-3.16	270-540	240-520	260-515	—
Standard deviation	—	—	.36	85.95	96.52	86.87	—
Coefficient of variation	—	—	.137	.237	.248	.231	—
			Number of Unsuccessful Students				
Sub-total	9	7	24.32	2740	2655	2698	8
Average	—	—	2.70	342	332	337	—
Range	—	—	2.02-3.31	240-510	240-445	255-470	—
Standard deviation	—	—	.44	86.15	77.69	70.08	—
Coefficient of variation	—	—	.163	.252	.234	.208	—
			All Students				
Grand total	21[a]	15	56.09	7100	7325	7213	20
Average	—	—	2.67	355	366	361	—
Range	—	—	2.02-3.31	240-540	240-520	255-515	—
Standard deviation	—	—	.39	84.4	91.91	81.0	—
Coefficient of variation	—	—	.145	.238	.251	.255	—

[a] Nine students who were accepted into the program chose not to attend.

[b] One student who was admitted to Graduate School has since withdrawn from school. The expected number of degree recipients is seven rather than eight as suggested by a total of twelve successful students.

Source: [19].

GRE test scores and GPA's of successful and unsuccessful students.

A significant fact, however, is that none of the 17 participants could have gained entry to Graduate School under the traditional 500 average GRE requirement. None of the participants would have had their admission applications forwarded to the College of Agriculture for admission consideration under the 425 average GRE criterion in the absence of a College program. Table 6 shows the relatively unfavorable admission status of ADP applicants on the basis of traditional admission standards. Differentials between the participants' GPA and GRE scores and those of the University and the College of Agriculture were the largest of any ADP group up to that point. Thus, the impact of the ADP is again emphasized, since the group had the lowest percentage denials (4.5 percent) of any ADP group to that time.

Of the 17 participants admitted during the 1971–72 academic year, nine students succeeded in gaining entry into Graduate School. This represents a success factor of approximately 53 percent. One student has received the master's degree and is currently employed at an 1890 institution. Eight students are currently expecting master's degrees in five different areas.[20] Eight students failed to gain entry at the Graduate School, but only two students were terminated for academic reasons. Seventy-one

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[20] Three of the eight expected degrees are in Agricultural Economics. The other disciplines are Entomology, Animal Science, and Agronomy, one each, and two in Soil Science.

Table 3. (Continued)

Variable	Terms Before Admission to Grad. School				Master's Degree Recd. or Expected		Terminated		Current Status		
	1	2	3	4	Recd.	Exp.	Academic Reasons	Other Reasons	Employ.	Grad. School	Not Known
Number of Successful Students											
Sub-total	—	2	8	2	4	7[b]	—	—	4	7	1
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
Number of Unsuccessful Students											
Sub-total	—	—	—	—	—	—	1	8	1	1	7
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
All Students											
Grand total	—	2	8	2	4	7[b]	1	8	5	8	8
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—

Table 4. Undergraduate grade point average and GRE scores comparisons, University of Florida Colleges, College of Agriculture and Academic Development Program, Academic Year, 1970-1971

Unit	Average Undergraduate GPA, Last Two Years, Domestic Students	Average GRE Score Domestic Students		Applications Denied (Percent)
		(Total)	(Average)	
University[a,b]	3.05	1141	571	38.7
College of Agriculture[a]	2.94	1074	537	26.6
Academic Development Program[c]	2.76	710	355	11.8[d]

[a] Based on averages of students whose applications were accepted.

[b] Includes 13 Upper Division Colleges, excluding Dentistry and Law.

[c] GPA based on averages of all students whose applications were accepted. GRE scores are based on averages of those students presenting scores. Over the 1970-1971 period, all applicants accepted presented GPA's while GRE scores are for 77 percent of those accepted into the program.

[d] Four of a total of 34 applicants. It should be noted that the denial rate for ADP participants is with respect to entry into the University, and not into Graduate School as is the case for the University and College of Agriculture figures. The actual percentage denied admission to the Graduate School should be low. Academic departments would not support a participant's application, unless the department has agreed to accept the student as a regular graduate student.

Sources: [13, 19].

Table 5. Academic performance of black academic development students, University of Florida, academic year, 1971-72

				GRE Scores			
Variable	Admitted Students	Institutions Represented	Undergrad. GPA Last 2 Years	Verb.	Quant.	Avg.	Students Presenting Scores
			Number of Successful Students				
Sub-total	9	7	24.34	2640	3150	2895	9
Average	—	—	2.70	293	350	322	—
Range	—	—	2.42-3.20	240-400	300-420	275-390	—
Standard deviation	—	—	.31	45.82	43.30	37.83	—
Coefficient of variation	—	—	.115	.156	.124	.118	—
			Number of Unsuccessful Students				
Sub-total	8	6	21.77	1540	1620	1580	5
Average	—	—	2.72	308	324	316	—
Range	—	—	2.07-3.26	280-330	250-390	265-360	—
Standard deviation	—	—	.38	21.68	50.30	34.17	—
Coefficient of variation	—	—	.141	.070	.155	.108	—
			All Students				
Grand total	17[a]	9	46.11	4180	4770	4475	14
Average	—	—	2.71	299	341	320	—
Range	—	—	2.07-3.26	240-400	250-420	265-390	—
Standard deviation	—	—	.34	38.60	45.82	35.34	—
Coefficient of variation	—	—	.124	.129	.135	.111	—

[a] Four students who were accepted to the program chose not to attend.

[b] One student who is included in the unsuccessful category was enrolled in the preparatory program.

Source: [19].

percent of the terminations (5 of 7) were for nonacademic reasons.[21]

Performance of ADP participants (1972–73 academic year).—Performance data on ADP participants admitted during the 1972–73 school year are limited to two academic terms (fall and winter). The relatively small sample size and narrow time frame does not permit comparable analysis to the other academic years. However, the following observation provides insights into the admission status of participants.

Ten ADP participants were admitted into the program representing 5 different institutions. All participants presented GPA's with an overall average of 2.82. Only three students presented GRE scores. All participants are classified as unsuccessful, since none have gained entry to Graduate School as of the winter term.

Five of the participants withdrew from the program. However, all withdrawals were for nonacademic reasons. Thus, a total of 5 "unsuccessful" participants are currently enrolled in the preparatory phase of the program. The average GPA of the 5 participants currently enrolled in the preparatory program was 2.73. Three of the students in the preparatory program presented GRE scores. One student had an average score of 575, with a 610 and a 540 score on the verbal and quantitative portions, respectively. Another student had an average score of 320, with a 280 and a 360 on the verbal and quantitative portions, respectively. The third student had an average score of 315 with a 330 and a 300 score

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[21] Data discrepancy with respect to successful and terminated students results from our definition of "successful." One student who is categorized as unsuccessful is currently enrolled in the preparatory program.

Table 5. (Continued)

Variable	Terms Before Admission to Grad. School				Master's Degree Recd. or Expected		Terminated		Current Status		
	1	2	3	4	Recd.	Exp.	Academic Reasons	Other Reasons	Employ.	Grad. School	Not Known
					Number of Successful Students						
Sub-total	—	3	5	1	1	8	—	—	1	8	—
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
					Number of Unsuccessful Students						
Sub-total	—	—	—	—	—	—	2	5	—	—	7[b]
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—
					All Students						
Grand total	—	3	5	1	1	8	2	5	1	8	7[b]
Average	—	—	—	—	—	—	—	—	—	—	—
Range	—	—	—	—	—	—	—	—	—	—	—
Standard deviation	—	—	—	—	—	—	—	—	—	—	—
Coefficient of variation	—	—	—	—	—	—	—	—	—	—	—

for similar portions of the test. In terms of traditional admission standards, only one of the three participants presenting GRE scores would have met the 500 average GRE criterion. Two of three participants presenting scores would not have had their applications forwarded to the College of Agriculture under the 425 GRE average criterion in the absence of the ADP program.

Summary, Conclusions, and Implications of the Florida Experience

Rapid and sustained economic growth of the U. S. economy and its accompanying expansion in aggregate demand has resulted in expansion in employment opportunities for black Americans. The Land Grant System has been a dynamic factor in such growth. The system, however, has exerted an uneven influence on human capital development for black and white Americans.

Civil rights legislation and court litigation have reduced overt cases of racial segregation and discrimination in Southern public institutions of higher education. These forces have not generated dramatic increases anticipated in black graduate enrollment and degree awards at such institutions. Traditional admission standards appear to be generating offsetting forces, because blacks tend to compete poorly with whites on tests of traditional design and objectives.

A joint University of Florida-Rockefeller Foundation Academic Development Program (ADP) in agriculture for black Americans was initiated in 1969. Of the 64 participants in the ADP as of the winter term of 1972–73, 18 (28 percent) have been awarded master's degrees, with two students proceeding to the Ph.D. level. Fifteen participants (23 percent) are currently at various stages of receiving master's degrees, and 6 (9 percent) are currently pursuing preparatory work. These three categories represent over 60 percent of the participants. Twenty-four students (38 percent) have been terminated from the program. However, only six terminations (25 percent) resulted from academic failure. An important finding from an admissions policy standpoint is the fact that only three (4.7 percent) of the 64 participants could have gained entry into the Graduate School on the basis of

Table 6. Undergraduate grade point average and GRE scores comparisons, University of Florida Colleges, College of Agriculture and Academic Development Program, Academic Year, 1971-1972

Unit	Average Undergraduate GPA, Last Two Years, Domestic Students	Average GRE Score Domestic Students (Total)	Average GRE Score Domestic Students (Average)	Applications Denied (Percent)
University[a,b]	3.10	1132	566	41.2
College of Agriculture[a]	2.98	1088	544	28.1
Academic Development Program[c]	2.73	652	326	4.5[d]

[a] Based on averages of students whose applications were accepted.

[b] Include 13 Upper Division Colleges, excluding Dentistry and Law.

[c] GPA based on averages of all students whose applications were accepted. GRE scores are based on averages of those students presenting scores. Over the 1971-1972 period, all applicants accepted presented GPA's while GRE scores were for 71 percent of those accepted to the program.

[d] One of a total of 22 applicants. It should be noted that the denial rate for ADP participants is with respect to entry into the University, and not into the Graduate School as is the case for the University and College of Agriculture figures. The actual percentage of ADP applicants denied admission to the Graduate School should be low. Academic departments would not support a participant's application, unless the department has agreed to accept the student as a regular graduate student.

Source: [13, 19].

the traditional 1,000 (500 average) GRE admission criterion. Only 11 percent of the participants (7 students) would have had their applications forwarded to the College of Agriculture for admission considerations under the 850 GRE (425 average) policy of the Admission's Office in the absence of a special College program for blacks.

Sixteen of the 18 degree recipients are currently employed with a significant number attached to the 1890 Land Grant System; the remaining are actively pursuing Ph.D. degrees.

The effectiveness of the ADP tends to be understated in terms of the opening up of opportunities for disadvantaged blacks to enter the University. The 64 participants represent students who entered the program. An additional 17 applicants were admitted to the program but chose not to attend.

The Florida experience demonstrates that educationally and economically disadvantaged blacks can succeed in graduate programs of traditional design if given the opportunity to make up academic deficiencies. Key components of the program's success are: (a) flexibility in traditional admission standards, particularly where traditional standards might not adequately measure the desires and motivation of disadvantaged minority groups for higher education, (b) availability of funds to support nongraduate level students in their preparatory graduate program, and (c) vigorous recruitment, coupled with adequate counseling and tutoring of students during the preparatory phase of the program.

The program has made a significant contribution to increasing the supply of black professional agriculturalists in the South. The experience, however, suggests a need for a regional program among Southern Land Grant institutions, since many of the successful participants are now productively employed in other Southern states. From this point of view, Florida has not captured the full benefits of state and Rockefeller Foundation investment in these participants. A unified regional program with pooled resources would reduce the cost-benefit disassociation of the investment of any single state.

No attempt has been made to compute the benefits of the program within the framework of a dollar cost per successful student ratio. To do so would be to assume implicitly that the investment in unsuccessful students was not socially and economically worthwhile. Many unsuccessful participants have likely gained from the social experience of attending a predominantly white major university. From this point of view the social benefit of the program would be larger than the private benefit in terms of master's degrees awarded at any given level of dollar investment.

Southern public institutions of higher education can aid regional and state economic development by institutionalizing programs similar to Florida's into their system. Such programs are vital for black participation in higher education in the region until such time as the effects of integration of secondary schools reaches the college level.

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Sectional Meeting G

MINORITY PROBLEMS AND AGRICULTURE

Discussants: George Wilbur, University of Kentucky; D. David Moyer, ERS, USDA, Madison, Wisconsin; Lynn Daft, ERS, USDA

Seminar Session 3.0

INTERNATIONAL TRADE POLICY IN FOREST PRODUCTS: CANADA AND THE UNITED STATES

CHAIRMAN: THOMAS R. WAGGENER, University of Washington

Implications of the 1970 Timber Review for Trade in Timber Products

I. IRVING HOLLAND

INCREASING prices for wood products in the United States, particularly softwood lumber and plywood prices, have generated much concern among administration officials and congressmen worried especially about the impact on the nation's building program. This concern is intensified as the nation faces the difficult question of how to increase the longer run wood supply to meet growing needs at reasonable prices while protecting and enhancing the quality of the natural environment. Although increased forest productivity and closer raw material utilization will receive major attention in the search for a solution to this dilemma, the future wood products import-export position of the nation, and especially of the U. S.-Canadian relationship, would also seem to bear on the problem.

Evaluation of the potential for trade in timber products in estimating future timber trends and requirements in the United States has generally been given incidental attention in past Forest Service reviews. Difficult as it is to make projections of domestic demand and supply for timber products, it is even more difficult to visualize the factors which will influence the development of foreign markets for U. S. wood exports or sources of supply for U. S. wood imports. Nevertheless, there is reason to believe that better estimates of future import and export possibilities are warranted, for several changes over time suggest the increasing importance of world timber products trade and their possible impact on the future U. S. position.

Since 1950 the timber products trade position of the U. S. has changed considerably. *Imports* of industrial wood in 1971 were 1.8 times imports in 1950, mainly because of increased imports of softwood lumber and newsprint from Canada. *Exports* of industrial wood in 1971 were 8.4 times exports in 1950, almost entirely because of increased exports of softwood sawlogs to Japan and pulp products to Japan and northwest Europe. Demands for wood products, particularly lumber, pulp, and paper and wood-based panel products, continue to expand in almost all the wood deficit industrialized nations of the world, and in some of the developing countries.

Although the United States forest economy is primarily domestically oriented, other nations with wood surpluses have looked to expanded world trade. Canada, the world's single most important exporter of wood products, has agressively promoted trade in wood with the U. S. as well as with European and other countries. The Soviet Union, Europe's most important supplier of softwood lumber, promises to become a more important exporter of lumber to Europe and pulp and logs to Japan and the Pacific Basin countries. Japan has become an increasingly wood deficit nation and thus a potentially important market for wood from North America, the Soviet Union and southeast Asia. Northwest Europe, at one time a net exporter of wood products, has, like the U. S., become an important importer of softwood lumber and pulp and paper although northern Europe remains a surplus wood area.

Wood Products Import-Export Projections

In the light of the growing importance of world wood trade and the possible implications for future U. S. wood consumption, the U. S. Forest Service in its latest study, *The Outlook for Timber in the United States,* gives specific attention to potential imports and exports of timber products [11]. The study reached several broad conclusions, stated below, respecting the

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future U. S. trade position with implications for U. S.-Canadian trade in timber products.

The U. S. will import significantly more wood products in the years ahead. At higher assumed prices, imports are projected to rise from 2.7 billion cubic feet roundwood equivalent in 1971 to 4.7 billion cubic feet by the year 2000; much of this increase will likely be met from larger imports of softwood lumber, and pulp and paper products from Canada. It is also likely that the U. S. will continue to draw more heavily than at present on tropical forests, primarily those of southeast Asia.

Exports of Kraft pulp and paper products are expected to rise as a result of expanding world markets. U. S. exports are projected to increase from 1.6 billion cubic feet roundwood equivalent in 1971 to 2.6 billion cubic feet in the year 2000. Some increase in the export of logs and chips is also assumed. However, the Forest Service concludes that increasing net imports, important as they may be, can represent only a limited answer to the problem of augmenting wood supply in the United States over the next 30 years.

Specific Forest Service projections of imports and exports of the major forest products are based on past trends and some assumptions about future wood price levels. Although there is no assurance that these estimates will be reached, they can serve as useful targets against which the future U. S. trade position, as influenced by world trade developments, can be viewed. These projections may be summarized as follows [11]:

1. If 1970 relative prices of stumpage and timber products remain constant, softwood lumber exports will be 1.2 billion board feet and imports 6.0 billion board feet in 1980 and the year 2000. Exports and imports of softwood plywood will amount to 300–500 million square feet. Hardwood plywood imports are projected to remain at a level of about 3 billion square feet.

Pulpwood exports, including the roundwood equivalent of chips, are projected to increase from 3.3 million in 1980 to 4.3 million cords in 2000; imports are constant at 1.3 million cords. Both imports and exports of wood pulp are to increase from around 8.5 in 1980 to 13.0 million cords roundwood equivalent in the year 2000; paper and board exports from 6.5 to 7.2 million cords; and imports from 11.0 to 14.0 million cords. Softwood log exports are expected to rise from 5.1 to 6.0 billion board feet between 1980 and the year 2000.

2. If relative prices for lumber increase 1.5 percent per year, plywood 1.0 percent, paper and board 0.5 percent, and stumpage 2.5 percent per year, exports for all products would be expected to decrease somewhat and imports to increase. In this case hardwood plywood imports are projected to rise from 3.3 million square feet in 1980 to 4.2 million square feet in the year 2000. Wood pulp imports could rise from 8.2 million cords roundwood equivalent to 14.6 million cords, and paper and board from 11.3 to 16.4 million cords. Softwood sawlogs exports would decrease from 4.7 to 3.9 billion board feet.

3. Should relative prices for lumber and plywood rise 30 percent over 1970, and prices of pulpwood, wood pulp, paper and board 10 percent, little change in exports over those described for price increases of 1.0 percent per year are expected. However, hardwood plywood imports could increase still further from 4.1 to 4.3 billion square feet.

Although these projections are based on explicit assumptions about future trade trends and prices of wood products, they also imply a knowledge of wood import-export price elasticity coefficients which show what changes in imports and exports can be expected with the assumed changes in wood product prices. Actually, there is little such information available. Unforeseeable modifications of trade conditions such as the erection or removal of trade barriers, changed comparative product cost patterns, or changed political situations in the relevant foreign market areas may completely override price change effects.

Even before we examine possible world trends it is obvious that the U. S. will continue to depend heavily on further development of Canadian forest resources for export to help meet anticipated wood products requirements, especially softwoods. However, other developments, some of them occurring in other parts of the world, will also act in an interrelated manner to determine the U. S.-Canadian trade position and whether or not the Forest Service projections at any set of domestic wood products prices will materialize. These developments may be summarized as follows:

1. The primary influence will be generated within the United States. That is, the amount of difference between what the nation will require (including exports) and domestic wood produc-

tion turns out to be will determine how much wood must be imported, how much we substitute nonwood products for wood, and the set of prices that emerges to effect the balance between demands and supplies.

2. Two principal external factors will also condition the future magnitude of U. S. wood *imports:* the extent to which Canada is able and willing to meet increased U. S. demands for softwood lumber, pulp, and newsprint at the prices which emerge; and the extent to which U. S. hardwood plywood and veneer demands can be met from present southeast Asian sources.

3. Two principal external factors will influence the future magnitude of U. S. wood *exports.* First is the extent to which U. S. producers of chemical pulps and Kraft papers and board can enter the future European and Japanese markets in competition with Canada, Scandinavia, and to a lesser extent with the Soviet Union. Second is the extent to which the U. S. enlarges or contracts its softwood lumber and log exports to Japan and perhaps other countries in the Pacific Basin.

4. Two other external factors could have some impact on future U. S. imports and exports of wood products, although their influence is most difficult to judge. The extent to which tropical forests in developing countries can contribute to world wood supplies, as well as the magnitude of future markets in these countries is one factor. The importance of plantation-grown wood as a source of wood for domestic processing in developing nations and as raw material entering world trade is another factor.

What effects these developments might have on the U. S.-Canadian trade positions may be better evaluated after an examination of the expected principal markets for wood, and principal wood surplus areas.

Principal World Markets for Wood

The United States

United States foreign trade in timber products is concerned chiefly with imports of Canadian softwood lumber amounting to 20 percent of consumption and newsprint accounting for about 70 percent of consumption, and, from southeast Asia, hardwood plywood and veneer which amounts to fully 57 percent of consumption. Exports involve softwood logs, pulp, paper, and chips to Japan, and pulp and paper to Europe.

Softwood lumber imports reached 7.2 billion board feet in 1971 and could amount to 10.0 billion board feet annually by the late 1970's. In total the U. S. is today a net importer of wood to the extent of 12 percent of total wood consumption.

Europe

Europe is the world's most important wood consuming region after the United States. In 1969 total industrial wood removals amounted to 192.5 million cubic meters, 16 percent of total world removals [7]. Since 1955, northwest Europe has had to import softwood lumber from the Soviet Union, pulp and paper from North America, and tropical hardwood logs from Africa in order to augment imports of lumber and pulp products from Scandinavia.

According to the FAO, Europe will continue to face a growing wood deficit of at least 53 million cubic meters of wood by 1975 and 66 million cubic meters by 1980 as the result of an expected 15 percent increase in consumption of lumber and plywood over 1965 levels, and an 86 percent rise in consumption of pulp and paper products [4]. Recent studies by the FAO conclude that the U. S. S. R. and Canada are likely to be the principal sources of increased softwood lumber imports, even though Scandinavia (particularly Sweden) expands exports to the rest of Europe. Cost advantages in pulp and paper manufacture now appear to lie with Canada and the U. S., and these two countries are the most likely sources of expanded pulp and paper imports for Europe.

Japan

A rapidly expanding economy has pushed Japan's demand for wood products far beyond her capability of supplying these needs from the domestic timber resource. All indications are that Japan will continue to strive for increased growth and trade but, in so doing, may become even more dependent on wood imports. As in most industrialized nations, softwoods are greatest in demand. However, Japan's forests are 52 percent broadleaved, 11 percent mixed, and only 37 percent coniferous. Between 1965 and 1972, Japan's wood import dependency grew from about 30 percent to 55 percent [1].

Japan depends on Canada for most of its softwood lumber imports, although Alaska contributes about 30 percent. Southeast Asia is the source of imported tropical logs and the U. S. and the Soviet Union the source of softwood log imports. U. S. softwood logs have been preferred because they are larger, yield higher quality lumber, and can be purchased on credit in contrast to domestic logs which must be paid for in cash.

Consumption of pulp and paper products in Japan has accompanied industrial expansion and economic growth. At the same time, the need to control pollution from pulp manufacture has encouraged higher pulp, paper, and board imports from Canada, and Kraft papers from the U. S. However, pulpwood from Siberia and chips from the U. S. must still be imported to augment domestic supplies. Chip imports reached 6 million cubic meters in 1971, almost all of this coming from the west coast of the U. S.

Future wood trade with Japan will most likely continue to involve lumber, logs, pulp, paper, and chips. Tropical timbers will continue to originate in southeast Asia, but softwood log imports will have to come primarily from the U. S. and/or the Soviet Union. Although demand for U. S. logs is likely to grow, actual U. S. exports will depend on whether or not log export restrictions are imposed. Estimates are that U. S. log exports to Japan will be only about 1.5 billion board feet by 1980, and perhaps only 2.0–3.0 billion board feet total to Japan and Canada, considerably less than U. S. Forest Service projections at any of the assumed price levels.

Although demand for softwood lumber in Japan is expected to increase, the import of lumber from the U. S. is less clear. Except for Alaskan producers, U. S. lumber manufacturers, though seemingly interested, have not yet undertaken the development of the Japanese market. U. S. producers no doubt view the U. S. market as most important and, in addition, may be unwilling or unable to undertake the manufacture of lumber to the unusual specifications demanded by Japanese customers. Greater export of lumber in the form of cants is a possibility, however, particularly in view of the fact that lumber can be shipped to Japan from the West Coast $10 per thousand board feet cheaper than it can be sent to the East Coast by water. Canadian lumber manufacturers do plan to increase softwood lumber to Japan and Alaskan shipments will also probably increase.

Plywood demand will continue to benefit from the trend against lumber as a result of the rapid move to construction of high-rise residential structures and prefabricated housing units in Japan. However, the outlook for export of either U. S. or Canadian softwood plywood is not encouraging unless it can be sold at prices comparable with those for luan plywood, not a likely development.

Japan continues to explore reliable pulpwood, chip, and pulp sources, and is not committed to any particular source. Long term agreements for pulpwood with the Soviet Union and for pulp with Canada have been made. The Japanese show a preference for U. S. wood chips, however, and the Pacific Northwest is most likely the long-term premier source of high quality export chips to Japan, if efforts are made to develop this market.

Other potential wood products markets

Besides Europe and Japan, potential markets for Canadian and U. S. wood products exports exist in Mainland China, Oceania, primarily Australia, and to some extent New Zealand, and the developing countries of Latin America, Asia, and Africa. Of these the most intriguing is Mainland China. China is believed to be practically self-sufficient in wood consumption (mostly fuel wood) at extremely low levels. It is believed that China's wood demands will rise as industrial and economic development proceed. If she can generate foreign exchange and chooses to allocate part of it to the import of wood products, a market of some magnitude could develop. If it does, it is apt to be supplied from North America, probably Canada, rather than from the Soviet Union [10]. China has reportedly already begun negotiations with Canada for the import of certain timber products.

Both Australia and New Zealand are highly developed countries with relatively high per capita wood use. However, neither nation figures importantly in total wood requirements because neither has a large population or industrial complex to support.

To complete the overview of potential world markets for wood, brief attention needs to be given the so-called developing nations, including Latin America, Africa (excluding South Africa), Asia and the Far East (excluding Japan, Australia and New Zealand), and the Middle East (excluding Israel). This vast area accounts for only 10 percent of total world wood consumption. Despite expectations of rising wood demands, this proportion is not expected to change much by 1985.

The only recent projections of potential wood use in developing countries originates with the FAO's Indicative World Plan for Agriculture [5]. The projections of increased wood product consumption are based on rather optimistic assumptions of increased economic development, rising incomes to support increased wood demands, as well as considerable expansion of forest products industries through investment and increased expertise in these countries by 1985. Conceivably the U. S. could increase its present small exports to some of the developing countries, but competition from Canada will likely be a limiting factor, and most of the increases may be met from expanded domestic or regional forest industries development.

The Principal World Surplus Wood Regions

Canada

Future U. S. trade in timber products will be influenced in a major way by production, consumption, and trade in several parts of the world, but particularly in Canada. Canada is the world's most important exporter of wood products accounting for fully 25 percent of the total value of world wood exports in 1969 [7]. Even as Canadians are consuming more wood than ever, the major portion of timber removals goes to support the growing export trade. And although Canada exports wood to at least 50 different countries, the United States is the destination for at least 75 percent in terms of value. In 1968 Canada cut 4.0 billion cubic feet of roundwood to meet domestic and export commitments. Exports to the U. S. accounted for 2.5 billion cubic feet, more than twice the volume used at home [3].

Historically there has been a strong relationship between U. S. and Canadian forest products industries. This relationship is expected to continue, and means that what Canada is able and willing to produce and export could significantly influence U. S. wood consumption. By the same token, the U. S. wood market will likely greatly influence Canadian wood trade and hence management and utilization of Canadian forest resources.

Canada's 588 million acres of forest land judged suitable for regular harvest is estimated to carry 498 billion cubic feet of growing stock, able to sustain an allowable annual cut of about 8.5 billion cubic feet under present cost-price levels for lumber and plywood, and somewhat improved prices for pulp and newsprint. This is over twice the volume cut in 1968 and it would come from British Columbia primarily, followed by Quebec, Ontario, and the Maritime Provinces [9]. Considering all wood products, Canadians estimate it will require about 7.6 billion cubic feet to meet domestic and export needs by the year 2000, well within the estimated 8.5 billion cubic feet of allowable cut. These projections are predicted on the assumption that Canadian harvesting and processing costs will not rise significantly and that export markets will develop as estimated.

The Soviet Union

Over the years there has been much speculation about the future wood trade potential of the Soviet Union. It is indeed difficult to ignore the fact that this nation alone has 20 percent of the total forest area of the world, 30 percent of the total growing stock, and perhaps 50 percent of the world's softwood timber reserves [8]. Despite the vastness of these resources, it is pertinent to question how much progress can be made in their utilization and what proportion of any increased output will actually enter world trade as exports.

The Soviet forest resource is said to cover 2.9 billion acres, 1.7 billion acres of which are actually forested. Because some of the area is considered to be unsuitable for exploitation or already over-used, there are actually about 803 million acres containing roughly 1.6 trillion cubic feet of timber as yet untouched. Four features characterize this timber base. (1) It is extensive. (2) The timber is mainly coniferous and of reasonable quality. (3) The number of species is limited making for homogeneity. (4) The major portion of the resource is poorly located with respect to consuming centers of either the nation or European countries.

The Soviet Union has long been an exporter of softwood lumber to Europe. Since World War II, Soviet pulp and paper products have also been exported to some degree. Most Soviet exports go to Great Britain and East Germany; there is also an active trade with Finland, Japan, and Taiwan.

In the opinion of a number of analysts, the forest industries in the Soviet Union are not necessarily to be favored in overall investment planning. Certainly since 1950 only about five percent of all industrial investments have gone to forestry, compared with 33 percent for fuel and power, 25 percent for steel, metal working, and engineering, and 10 percent for chemicals [2]. Actually, it seems that forestry development in the new industrial centers of East Siberia has been more or less incidental to power generation and mineral extraction and processing. In West Siberia the investment emphasis is in the development of a petroleum industry, not forestry. It seems improbable that the Soviet investment pattern will be greatly different over the next 15 years. The future expansion of the forest industries will very likely be determined by production to meet domestic demands and by the success of the U. S. S. R. in production and export in other sectors.

On balance it is estimated that exports of Soviet wood products could increase by as much as 40 percent by 1985. Despite the long transport from Siberia, the U. S. S. R. will be able to compete in European markets at least as well as today. However, the best long term opportunities for expanded trade appear to lie to the east, i.e., to Japan and southeast Asia. These exports will originate in the Soviet Far East and will probably impact export possibilities from Canada and the U. S. in the Pacific Basin.

Scandinavia

The forests of northern Europe have been an important source of wood products for the rest of Europe for a long time. Sweden is the largest producer of forest products, followed by Finland, Norway, and Denmark. The forests of Scandinavia are expected to make a modest increased contribution to Europe's future wood requirements, about 25 million cubic meters by 1975. But this increased output will entail rising costs. Sweden's forests can support a 20 percent increase in output over the next 20 years. The cut in Norway and Denmark can be increased somewhat, but expansion in Finland will be difficult [4]. As noted earlier, Europe's very large deficit will have to be filled mainly with imports of sawnwood from the U. S. S. R. and Canada, and pulp and Kraft paper from Canada and the U. S.

Wood From Fast-Growing Plantations

Although most planting of trees takes place in the north temperate zone, there is increasing interest in the establishment of plantations elsewhere in the world, particularly in the warm zones, as a basis for wood products manufacture, domestic consumption, and trade. There is no doubt that where intensive plantation forestry is practiced yields can be high, and that plantations can become the basis for development of wood industries where none existed before. This point is well illustrated by experience in Chile, Brazil, Argentina, Uruguay, South Africa, and New Zealand. The FAO estimates that there are about 2.2 million acres of softwood and 8.6 million acres of hardwood plantations in the developing world, excluding Mainland China [6].

The importance of plantation grown wood in developing countries will likely increase as a source of wood for local use and in some cases for export within specific regions. However, the total area and volume of softwood plantations outside the north temperate zone is still too limited to affect world wood trade very much. Furthermore, except in a few cases, it has yet to be demonstrated that low cost raw wood itself can insure success in wood products trade on world markets in competition with already established large-scale producers of mass-grade products in the north temperate zone.

Wood From Tropical Forests

There is little question that the coniferous forests of North America and the Soviet Union are going to be of major importance in meeting future world requirements. But much more uncertainty surrounds the usefulness of the world's tropical hardwood forests in this role. According to the FAO there are about 850 million hectares of tropical forests carrying roughly 125 trillion cubic meters of wood. However, because these forests are as yet little used, information on their true extent and composition is far from complete.

Tropical rain forests may carry 200–300 cubic meters per hectare, but they are overly rich in species with hundreds sometimes found on a single hectare. Single commercially marketable species may be represented by one or two trees per hectare making extraction uneconomic. There is a general lack of information on wood physical and mechanical properties of most species and limited experience in their use.

To date important commercial exploitation of tropical hardwoods has been limited to West Africa with exports going mainly to Europe, and to the tropical forests of southeast Asia, notably Indonesia, Malaysia, the Philippines, and New Guinea. The forests of southeast Asia contain the greatest reserves of usable tropical hardwood and these forests are supplying most of the tropical hardwood being used in Japan and the U. S. Some increased output from tropical forests is expected in 1985. Much of the future U. S. consumption of hardwood plywood and veneer as projected by the Forest Service will come from southeast Asian forests, as is the case today.

Conclusions

After this brief review of world forest products production, consumption, and trade, what can be said for the Forest Service import-export projections and implications for U. S.-Canadian trade in wood? Canadian export possibilities suggest that U. S. import projections for softwood lumber, pulp, pulpwood, and newsprint can be met, although there surely is some limit to imports from Canada in view of her commitments to other countries and the possibility that production costs may rise relative to prices.

Evaluation of the softwood export projections is more difficult. The Japanese market will be able to absorb more than the 1.9 billion board feet of softwood logs imported from the U. S. in 1971. But, it is hard to visualize the projected 5.0 to 6.0 billion board feet of sawlogs being exported at high prices, or if pressures for export restrictions develop. Should stricter restrictions prevail and/or log prices rise significantly, Japan will look to the Soviet Union for softwood logs, to southeast Asia for more tropical timber, and to Canada for more lumber.

Projected exports of hardwood lumber may be reasonable, but they are so small as to be unimportant. Exports of softwood lumber will probably not grow much, as projected by the Forest Service. Alaskan shipments are likely to increase, however, perhaps to 500 million board feet.

Projected exports of 4 to 5 million cords of pulpwood, including chips, may be quite reasonable in view of the large potential Japanese market and supply possibilities. However, much closer utilization of logging wastes will have to be affected if this projection is to be realized, and so far this has not been shown to be economic. Forest Service projections of pulp and paper exports, though quite large, are probably attainable in view of the very large expected deficits in Europe and Japan. But, this may be a little optimistic considering Canada's continuing dominance in the pulp and paper field.

In general, the Forest Service import projections appear to be attainable, and imports will continue to dominate exports in the important categories of lumber, newsprint, and hardwood plywood. Canada will remain the mainstay for increased U. S. imports of the softwood products. Southeast Asia will continue to be the main source of imported hardwood products. Export projections are probably high for softwood logs and a bit optimistic for pulp and paper products. The U.S.-Canadian wood trade relationship will likely be maintained if not strengthened over time.

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Economic Trends in the Canadian Forest Products Industry*

T. M. Apsey, M. M. Garton, and C. Hajdu

RAW MATERIAL SHORTAGES (temporary ones at least) are becoming vividly apparent in the Western World; timber represents a part of this shortage. Canada has an unutilized timber resource which is becoming increasingly important in this atmosphere of tightening supply. The paper takes a practical look at the size and potentials for Canada's excess wood supply.

The Forest Resource Potential and Its Usage

The total land and water area of Canada approximates 2.5 billion acres of which almost 800 million are classed as forest land. Close to 1.3 billion acres have been designated as wild land, most of it located in the Yukon and the Northwest Territories. British Columbia contains the largest area of forest land suitable for regular harvest, 135 million acres, followed by Quebec with 122 million, and the Prairie Provinces with 120 million. Virtually all nonreserved forest land in Canada is owned by the provincial governments, with the exception of the Yukon and Northwest Territories which are owned by the federal government.

In 1968 merchantable timber in Canada approximated 630 billion cubic feet by volume according to the most recent National Inventory (excluding Labrador, Yukon, and Northwest Territories and immature timber in British Columbia). Eighty percent of this volume is softwood as shown in Table 1. The most important species of trees in Canada are spruce, true firs, jack and lodgepole pines, poplar, and hemlock. The earlier 1963 National Inventory indicated that British Columbia contains 50 percent of the total merchantable timber volume in Canada, and close to two thirds of that is in trees with a diameter at breast height in excess of 10 inches.

Canada's forests are managed on the principle of sustained yield. The annual allowable cut based on sustained yield as indicated by government studies and informed industrial opinion would permit gross removals of 10.7 billion cubic feet per year while total roundwood removals in 1970 have approximated 4.3 billion cubic feet. Therefore, a theoretical increase of about 6.4 billion cubic feet would appear to be possible on the basis of current data.

Remoteness, poor stand quality, adverse terrain conditions, etc., all contribute to reduce the theoretical gross physical annual allowable cut. On the basis of 1972 rates of return in the wood industry and comparable return for the paper and allied industry, the volume of economically removable timber is estimated at 8.0 billion cubic feet. The value of Canada's forest resource is amplified by the fact that construction grade softwoods account for 8.2 billion of Canada's gross physical annual allowable cut of 10.7 billion cubic feet and 6.3 billion of the economic annual allowable cut of 8.0 billion cubic feet as shown in Table 2. The economic annual allowable cut is only 75 percent of the gross physical annual allowable cut of 10.7 billion. That is the economically feasible increase in timber removal would be 3.7 billion cubic feet at early 1972 prices and costs, and not 6.4 billion. This is a significant distinction which is not properly appreciated in general. The economic annual allowable cut is a variable amount since it is determined by product prices and production costs. For example, record prices of early 1973 temporarily increased the economic annual allowable cut. Hence, due to Canada's abundant resource endowment, the limiting factors on current forest products production are world demand and the availability of labour and capital, not of timber.

During the period 1951 to 1970 actual roundwood production in Canada expanded by 25 percent from 3.4 to 4.3 billion cubic feet and in British Columbia by over 100 percent from 0.9 to 1.9 billion cubic feet. Production in all other provinces remained virtually unchanged. In 1951 British Columbia produced 25 percent of Canada's total primary forest products and in 1970 British Columbia accounted for 45 percent of this production. Canada's roundwood production in 1971

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* The views expressed in this paper are those of the authors and do not necessarily represent the views of the company and association they represent.

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Table 1. Lands and timber, Canada, 1968

Area Classification by Region

Class	Quantity (Million Acres)
Forest land[a]	
Suitable for Regular Harvest	588.3
Not Suitable for Regular Harvest[b]	191.0
Reserved[c]	17.0
Total Forest Land	796.3
Wild Land[d]	1,296.3
Agriculture	162.5
Other (urban etc.)	8.9
Total Land	2,264.0
Water	200.8
Total Land and Water	2,464.9

Merchantable Timber by Region*

Inventoried Nonreserved Forest Land Only

Species	Quantity (Million Cu. Ft.)
Softwoods	
Spruce	204,964
True Firs	92,842
Douglas Fir	19,142
Hemlock	61,433
White Pine	6,032
Red Pine	1,221
Jack & Lodgepole Pines	77,019
Ponderosa Pine	348
Cedar	34,478
Larch (Tamarack)	728
Yellow Cypress	4,084
Other Softwoods	592
Total Softwoods	502,883
Hardwoods	
Poplar	61,892
Other Hardwood	64,623
Total Hardwood	126,515
Total Hardwood & Softwood	629,398

[a] Land capable of producing stands of trees 4 inches d.b.h. and larger on 10% or more of the area. Shelter belts and units of forest of 5 acres or less and scattered are excluded. This land class does not include agricultural land currently in use, although capable of producing trees as above.

[b] This forest land has an observed or estimated productivity whereby a rotation period of an undetermined length is required to grow a merchantable stand of trees, but ultimately the forest should have harvest possibilities.

[c] Forest land in parks, game refuges, water conservation areas and nature preserves, where, by legislation, wood production is not primary.

[d] Barren, muskeg, rock, and land with scrub, and land with forest cover substandard to forest land.

* Excluding Labrador, Yukon, and Northwest Territories where no complete inventories are available. Excluding B.C. immature volumes.

Source: Glenn H. Manning and H. Rae Grinnell, *Forest Resources and Utilization in Canada to the Year 2000,* Environment Canada, Forestry Service, 1971. (Data supplied by the provinces.)

was converted into 12.4 billion board feet of softwood lumber, 0.5 billion board feet of hardwood lumber, 2.1 billion square feet (3/8 inch) of softwood plywood, 335 million square feet (1/4 inch) hardwood plywood, and 17.5 million tons of pulp.

During 1970–72, Canadian exports to the United States averaged 56 percent of Canada's softwood lumber production, 53 percent of Canada's market pulp, and 72 percent of newsprint production. Due to higher production costs in Canada and the 20 percent U. S. tariff barrier, Canada exports almost no plywood to the United States. Canada is exporting 33 percent of its market pulp, 20 percent of its softwood plywood, and 12 percent of its softwood lumber production to markets other than the United States. The European Community, including the United Kingdom, and Japan account for the largest volumes of overseas exports.

Financial Trends

While Canadians and Americans receive the same revenue for their forest products, the costs to Canadian producers are considerably higher. The Canadian forest industry operates under a much greater degree of government supervision and restrictions. This characteristic, combined with Canada's regional remoteness and rugged terrain as well as higher costs of investment, operation, and taxation, results in Canadian producers tending to receive a lower return on investment than Americans.

Table 3 illustrates that during 1967–72, return on shareholders equity for the Canadian forest industry averaged 4.3 percent lower per year than the United States forest industry compared to 1963–66 when the Canadian forest industry enjoyed slightly better returns, by an average of 1.2 percent per year. The table also

Table 2. Estimated annual allowable cut by region[a] (million cubic feet), Canada[b]

	Annual Allowable Cut									Nonutilized Softwood Annual Allowable Cut			
	Gross Physical			Economic[c]			Actual 1970 Production						
Region	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Soft-wood	Hard-wood	Total	Gross Physical	%	Economic	%
British Columbia	3,321	30	3,351	2,935	15	2,950	1,922	12	1,933	1,399	33	1,013	42
Prairie Provinces	1,040	610	1,650	728	427	1,155	247	28	275	793	19	481	20
Ontario	1,333	1,293	2,626	718	816	1,534	468	125	593	865	20	250	10
Quebec	1,837	412	2,249	1,350	242	1,592	854	167	1,021	983	23	496	21
Atlantic Provinces	649	217	866	570	190	760	416	48	464	233	5	154	7
Total Canada	8,180	2,562	10,742	6,301	1,690	7,991	3,905	380	4,285	4,275	100	2,396	100

[a] On nonreserved inventoried public and private forest land (506.9 million acres). Some 272.4 million acres had not been inventoried in 1968. Three quarters of this noninventoried acreage is located in Labrador, Yukon and N.W.T. Includes growth on immature acreage in B. C.

[b] Excluding Labrador, Yukon, and Northwest Territories.

[c] The annual allowable cut on areas now physically accessible or becoming so which could be utilized under present cost/price levels for lumber and plywood and somewhat improved prices for pulp and newsprint.

Sources: GPAAC 1. Glenn H. Manning and H. Rae Grinnell, *Forest Resources and Utilization in Canada to the Year 2000*, Environment Canada, Forestry Service, 1971. (Data supplied by the Provinces).
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Table 3. Return on equity (net profit after taxes as a percentage of shareholder's equity)

	All Industries		All Manufact.		Forest Industry (SIC 24 & 26)		Wood Industry (SIC 24)		Paper & Allied Ind. (SIC 26)	
	U. S.*	Can.	U. S.	Can.	U. S.	Can.	U. S.	Can.	U. S.	Can.
1963	10.6	10.0	10.3	10.2	8.1	10.6	8.2	11.6	8.1	10.4
1964	11.5	11.4	11.6	11.0	9.5	11.5	10.0	10.4	9.3	11.8
1965	12.6	12.0	13.0	11.1	9.6	9.8	10.0	6.6	9.4	10.5
1966	13.0	11.4	13.5	11.0	10.4	10.8	10.0	7.4	10.6	11.6
1967	11.8	10.3	11.7	9.2	8.9	5.6	8.6	3.8	9.1	6.2
1968	12.2	10.5	12.1	9.9	11.3	6.9	14.6	11.1	9.7	5.8
1969	11.6	10.1	11.5	10.2	11.1	8.1	13.2	9.4	10.1	7.7
1970	9.8	8.6	9.3	7.4	6.6	3.0	5.9	—2.5	7.0	4.5
1971	9.7	9.6	9.7	9.5	7.0	3.4	11.3	4.2	4.8	3.2
1972	10.5	10.5	10.6	11.1	11.7	4.1	16.3	11.4	9.0	2.0

* First National City Bank, New York.
Sources:—Federal Trade Commission; Statistics Canada.

illustrates that in recent years this industry had substantially lower return in both countries than either the all-industry average or all-manufacturing average.

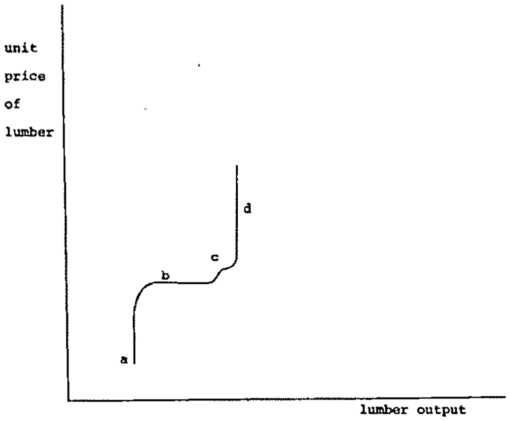
High lumber prices in 1972 resulted in a sharp recovery of profits in the wood industries, but the paper and allied industry still suffered a poor year. Thus the total Canadian forest industry performance remained inadequate. Wood product prices increased further in the first half of this year but are now declining. Pulp and paper prices, however, have recovered. Nevertheless, the table clearly indicates that the recent price rises, in this industry, were completely justified, if only to restore historical levels of profitability and to compare at par with other industries so as to attract further investment.

None of the approximately 1,000 forest products companies in Canada represents alone more than 10 percent of total Canadian sales or 3 percent of total United States consumption. For this reason, Canadian exporters of forest products are "price-takers" in the fullest sense; each producer is facing an elastic demand and sells at the prevailing market price without ability to set it. Canada sells forest products in more than 35 countries, and the prevailing price is world market price influenced by the demand in all these countries.

The elasticity of supply of Canadian forest products is not uniform at all price levels as indicated in Figure 1. Specifically, at low prices the industry's supply is inelastic, due to the tenure system under which much of Canada's timber is held, and to large fixed investment in the industry. Rights to cut government timber are normally allocated on the basis of past utilization records. Firms must, therefore, utilize the forest to a significant degree virtually regardless of prevailing price levels even at times of low world demand in order to maintain their timber tenures.

One might note that supply is not quite as inelastic at low prices in the United States as in Canada. A much greater portion of the timber in the United States is owned privately and is therefore subject to market influences.

At moderate prices supply tends to be quite elastic while the industry is attempting to increase the rate of utilization of existing mill capacities. Should short term demand rise sufficiently to promulgate supply increases to near



a: inelastic supply; constrained by minimum required timber removals;
b: elastic supply; moderate prices and excess capacity in permanent mills;
c: variable elasticity of supply; prices rise as permanent mills near maximum capacity utilization, but prices stabilize as temporary mills start operating;
d: inelastic supply; full capacity utilization in the short term.

Figure 1. Canadian Lumber Supply

full capacity, supply again tends to become inelastic and prices rise until equilibrium is reestablished.

In the case of lumber, however, rises in demand, and hence prices, can yield additional supplies even in the short term through start up of small portable mills. In the United States where more timber is owned privately and hence production decisions are more flexible than in Canada, small temporary sawmills may provide some 10–15 percent additional lumber production capacity in periods of high demand. Once these mills operate, further rises in demand for timber result in price increases in the short term. That is, supply would again become inelastic.

This unusual short term supply tendency is partly responsible for the historical instability of prices in the lumber industry as depicted on Figure 2. Of course, volatile demand conditions are contributors of equal importance but demand forces have in the past been studied and are now fairly well understood. For instance, most of us recognize the importance of mortgage rates to new housing construction and we would pay them full cognizance in any attempt to forecast lumber prices. But, efforts to build lumber price forecasting models of acceptable predictive performance have been singularly unsuccessful in the past, precisely because of inadequate appreciation of supply conditions in this industry.[1]

Production Projections

Canada is a net supplier of forest products which appear to be in high demand around the world. Thus a long term projection of future supplies from a Canadian point of view may be

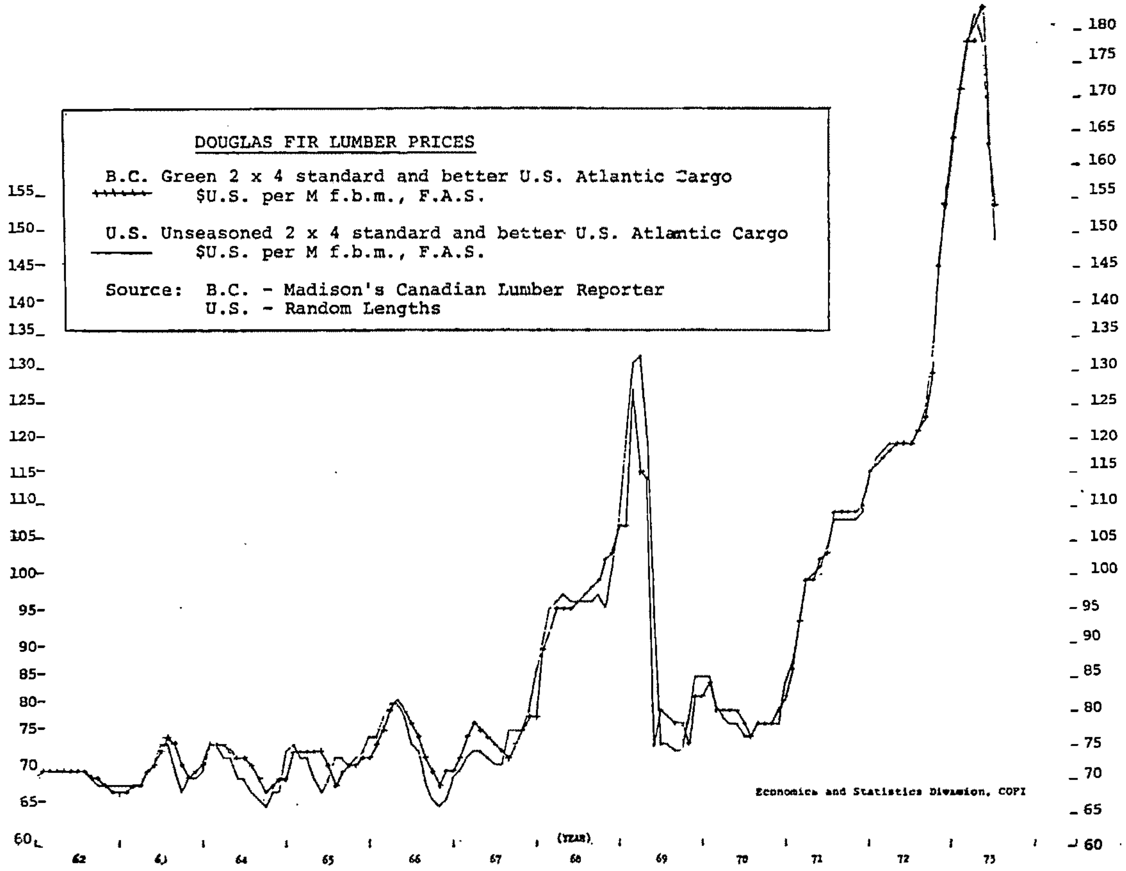


Figure 2

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[1] The most recently published model, for example, is by F. Gerard Adams and John Blockwell, "An Econometric Model for the U. S. Forest Products Industry," *Forest Science* 19:82–96, June 1973. This model represents one of the best econometric efforts to date but its practical usefulness may be rather limited for two reasons. First, the model is medium term while short term forecasts would appear to be more useful and, second, its linear supply schedule which ignores variable elasticity conditions could not yield forecasts with large sudden price swings so characteristic of this industry.

of interest. The following are based on a detailed analysis of the existing resource base supplemented by the informed judgement of many experts. With continued favourable access to lumber markets, by the year 2000 Canada could produce about 24 billion board feet of softwood lumber as Figure 3 illustrates. With present market prospects for plywood—which incidentally are not nearly as favourable as for lumber because of inroads being made by other panel products—softwood plywood production might rise to an estimated 3.8 billion square feet as illustrated by Figure 4.

These levels of production can be accommodated within the allowable cut potential and still permit sufficient expansion of the pulp industry. As Figure 5 illustrates, production in the forest products industry in Canada should not reach the economic annual allowable cut limitation until about 1989, and the gross physical annual allowable cut limitation only after the year 2000. These are, of course, broad indicators and they reflect conditions which confronted the industry in 1972. Future studies should provide alternative forecasts based on different technological, forest management, and market assumptions.

Markets for Canadian Forest Products

Transportation costs represent approximately 25 percent of the delivered price of Canadian forest products and therefore have a major influence on their pattern of marketing. To the major market, the United States, Canadian forest products are shipped by water, rail, and road. The feasibility of transportation by ship to the United States depends on good access to cargo facilities at both departure and destination, large product volumes, and long distances. Under these circumstances cargo transportation will normally be considerably cheaper than either rail or truck.

Coastal British Columbia producers normally ship by water to coastal United States. Approximately 77 percent of coastal British Columbia lumber shipments in 1971 were waterborne, the bulk of which were destined for the United States. Cargo shipments from coastal British Columbia can be equally well routed to overseas markets without incurring substantially higher transportation costs. For example, in 1972 the cost of shipping 1,000 board feet of lumber from Vancouver, British Columbia, to Boston was approximately $35.00 by cargo, to Tokyo about $30.00, and to Liverpool about $38.00. Hence

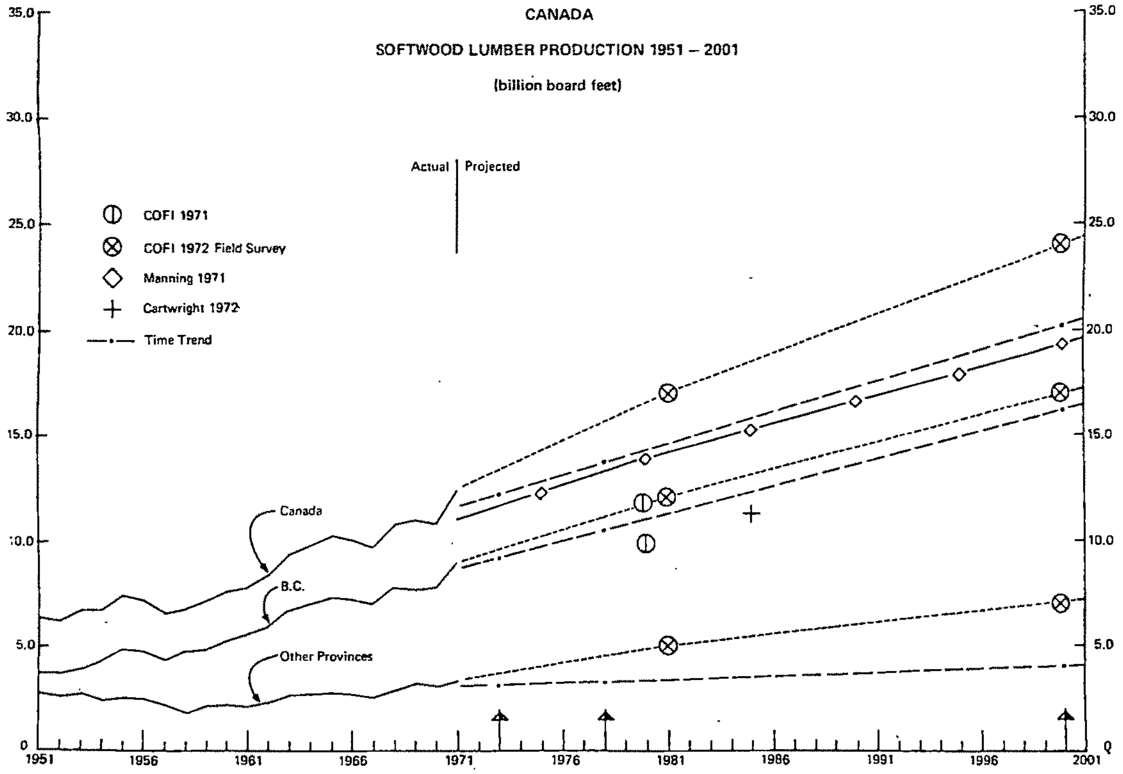

Figure 3

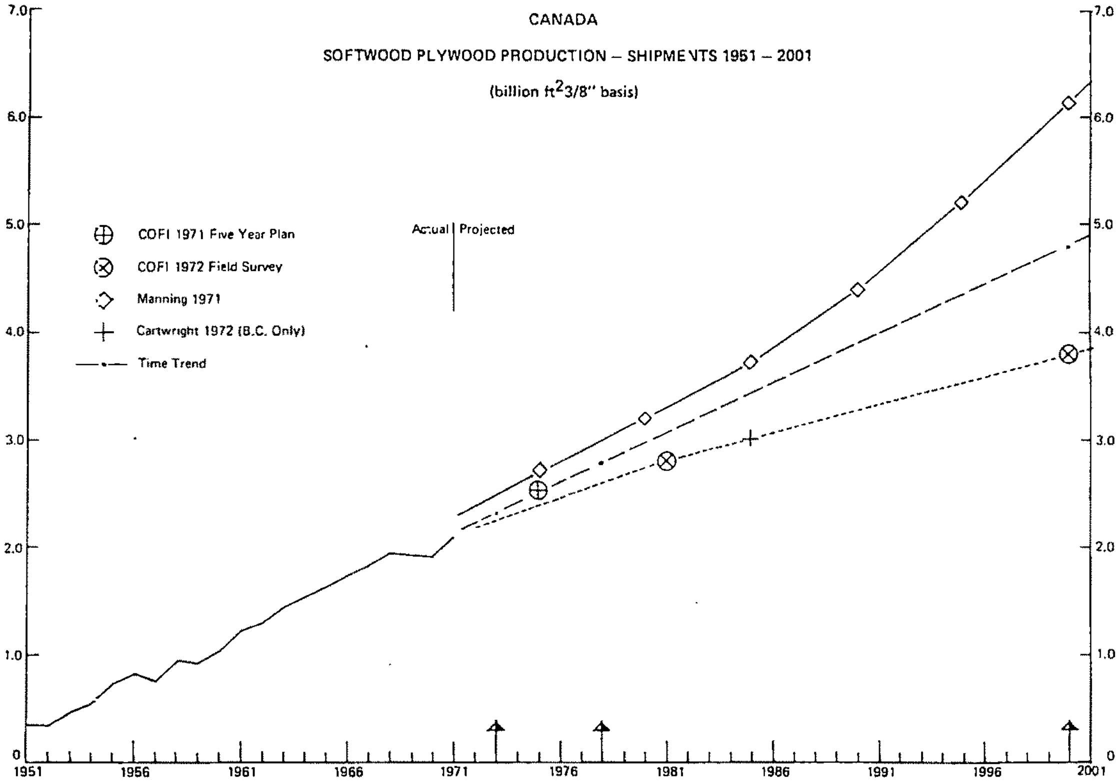

Figure 4

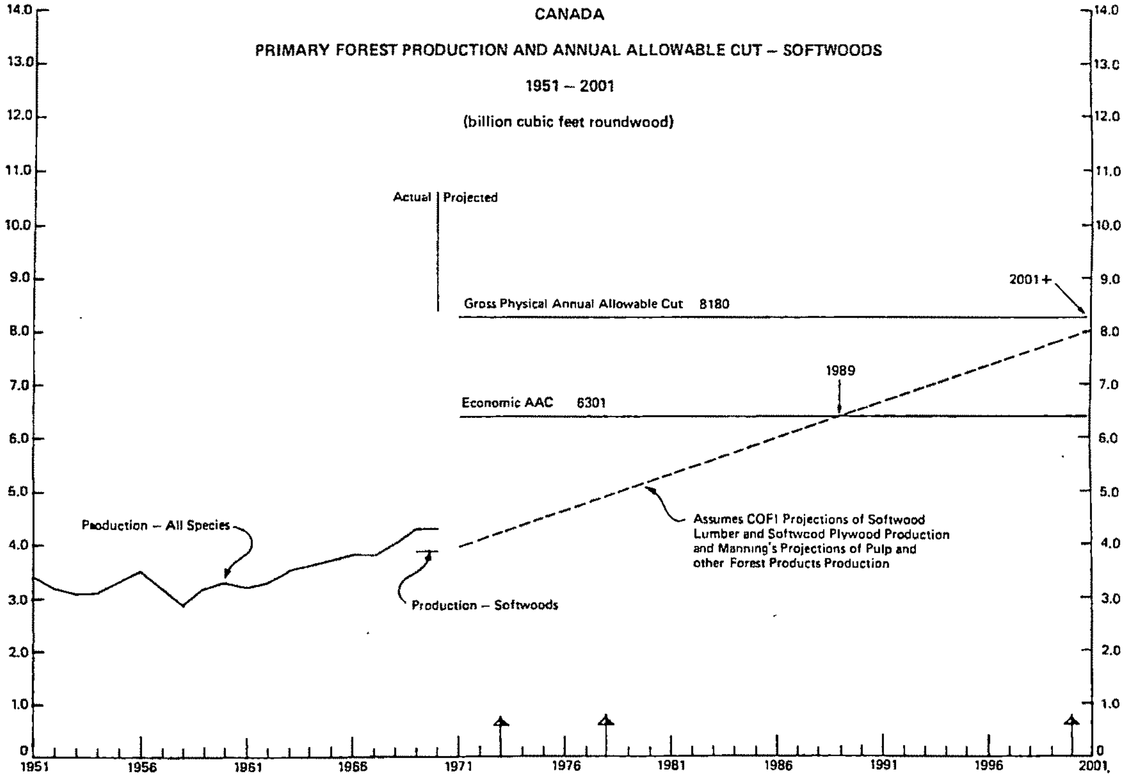

Figure 5

while physical distance between each of the three cities and Vancouver varies between 4,200 and 7,800 miles, or 85 percent, the cost of cargo transportation varies only about 27 percent. At the same time, rail transportation costs between Vancouver and New York, approximately 3,300 miles over land, which for all intents would be compared with the cargo cost between Vancouver and Boston, was $61.00 per 1,000 board feet.

Noncoastal producing regions of Canada are, however, tied to inland rail markets of North America because substantially higher costs are involved in reloading from rail or truck to cargo facilities than the saving afforded by waterborne shipments. To some extent these reloading costs are being reduced by automation so that some major companies are now shipping Canadian forest products overseas, but still not to the United States. For example, no waterborne lumber shipments to the United States originate from the interior of British Columbia at all. Thus the pattern of market segmentation is that waterborne shipments supply the United States coast from the British Columbia coast, and the bulk of United States bound lumber from noncoastal regions is shipped to the midwest from Canada's interior regions by rail and to a lesser degree by trucks.

Fluctuation in United States demand makes export forecasts to the United States difficult. Figure 6 illustrates a projection for Canadian softwood lumber exports to the United States made under the assumptions of 50 percent of Canadian production and 60 percent of Canadian production. The 60 percent figure represents recent historical trends, but when uncertainties in the U. S. are accounted for, overseas markets may be preferred by the Canadian industry and a lower figure may be more appropriate.

Demand for pulp and paper products is expanding. There is no large expansion in progress due to low return on investment in recent years. One might therefore anticipate increases in prices for these products.

The United States has grown increasingly dependent upon Canadian forest product supplies. Canadian exports during the period 1970–1972 accounted for 20 percent of the United States softwood lumber consumption, 7 percent of United States pulp consumption, and 64 percent of United States newsprint consumption. United States imports of softwood lumber and pulp and

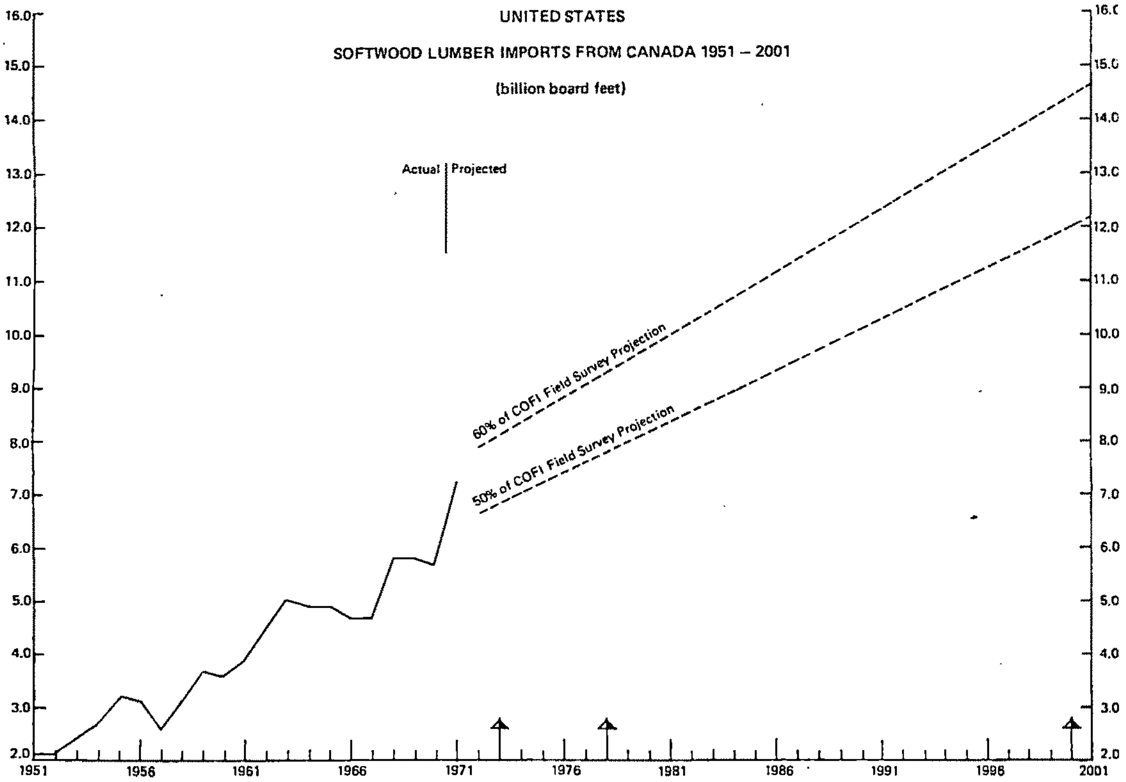

Figure 6

paper from countries other than Canada are insignificant. Canada, in the meantime, is developing overseas markets. Canada is exporting overseas some 33 percent of its market pulp production, 20 percent of its softwood plywood production, 12 percent of its softwood lumber production, and 18 percent of its newsprint.

In the past, overseas markets for Canadian forest products have characteristically consisted of product forms and qualities which are not heavily demanded in North America. For example, very little construction grade dimension lumber has been marketed overseas. Lumber exports to the European markets have consisted mainly of high quality clear and shop grades. Exports to other overseas markets such as Japan often consist of large or unusual size classes. Serious efforts are being made by Canada to have Canadian building methods accepted in these markets so that standard products could be sold overseas.

The serious housing shortage in Japan and Europe is receiving attention from the governments. This should increase overseas demand for Canadian building materials. Realignment of exchange rates also improved the attractiveness of overseas markets to Canadian producers.

In the past, the Canadian forest products industry has acted as a "buffer" supplier for the United States. Recent trends indicate that this function is changing. Alternative markets for Canadian forest products are emerging which will serve to stabilize partially the Canadian industry. Shipments and prices of the Canadian forest products industry should become less dependent on U. S. demand cycles in the future.

Conclusion

As was stated at the beginning, Canada has unutilized softwood timber resources at a time when many major countries are becoming more dependent on imports. This resource must be brought into production prudently. To assure balanced development, the economic stability of the forest products industry must be observed as an important objective. In the past decade insufficient regard to the stability of this industry by government, lack of economic and planning expertise by the industry, and volatile world market conditions have yielded an economic performance which compares in general unfavourably with other industries.

The Influence of U. S. Trade Policy on Forest Products Trade

ADRIEN E. GAMACHE

WHEN I WAS ASKED some months ago if I would be willing to present a paper to this group on the subject of the forest products trade with Canada, I was somewhat reluctant since I fancy myself no expert in this area. However, I am a taxpayer with the taxpayer's usual distaste for taxes, particularly taxes which have as their primary objective the subsidization of private industry.

A protective tariff, of course, is a tax on the consumer, the effect of which is to subsidize the domestic industry which is the object of the protection. It is essentially a sales tax and, as such, is regressive in nature. Therefore, I do not look upon this forum as an opportunity to present the results of a scholarly investigation of the effects of trade barriers. I look upon it more as an opportunity to praise the current trend towards the elimination of an onerous tax, to encourage further movement in this direction, and, most importantly, to comment on some of the other factors that may influence the forest products trade between the U. S. and Canada in the future.

Happily, the industry with which I am most familiar, the U. S. forest products industry, is among the least protected of American industries as far as tariffs are concerned. Both Canadians and Americans should be grateful for that. Why? As an example, in 1972 Americans consumed over 40 billion board feet of lumber, of which about 8 billion came from Canada, primarily from British Columbia. Recall that lumber prices reached all-time highs in 1972, highs which were exceeded in early 1973. For example, the price of unseasoned Douglas fir 2 × 4's, of "random lengths" and graded "standard and better" averaged $160 per thousand board feet (MBF) in December of 1972 [4]. The previous high of $131 per MBF occurred in February of 1969 [4]. A 1973 high of $185 per MBF was reported this past April [3]. To put these figures in proper perspective, the low monthly average price during the past five years was $72 per MBF, which occurred in January and February of 1970 [4]. Wide swings in lumber prices are decried by the housing industry and consumer groups and of course tend to be a destabilizing influence in communities in which lumber manufacture is the economic base. It does not take a great deal of economic expertise to lead one to the conclusion that the observed swings would be significantly greater, particularly on the high side, without the increments of supply with which Canada provides the U. S.

As far as Canada is concerned, lumber exports to the U. S. of 8 billion board feet per year represent direct export income of about $800 million per year. This is to say nothing of the indirect and induced income effects which would be generated by an export trade of that magnitude.

My objectives today are modest. They are to review briefly the history of U. S. trade policy since 1930, an era which in general has been one of trade liberalization; to comment on some trade policy matters which may have a bearing on U. S.-Canadian forest products trade in the foreseeable future; and to comment on some of the other factors which have ramifications for that trade.

Development of U. S. Trade Policy

Prior to 1934 Congress wrote its own tariffs, the objectives of which were protection of American industry from foreign competition. The tariffs of other countries were not considered in the process and neither was foreign policy. From the close of World War I to the early 1930's Congress raised the level of tariffs several times. Tariff acts passed during the period were the Emergency Tariff Act of 1921, the Fordney-McCumber Tariff Act of 1922, and in 1930 the Smoot-Hawley Act. Each successive act raised tariffs to new all-time highs. The Smoot-Hawley Act in fact represents the all-time high point in U. S. tariffs.

The new Administration and the new Congress which came to power in 1933, when the nation was beginning to emerge from the great depression, brought about sweeping and significant changes in tariff policy. The Reciprocal Trade Agreements Act of 1934 implemented a low tariff philosophy and, more significantly, gave the President authority to negotiate with foreign countries to obtain reciprocal reductions in tariffs

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or other trade barriers. The law specifically provided that the President did not need approval of the Congress to lower U. S. tariffs. It also limited such reductions to 50 percent and prohibited the president from transferring goods between the dutiable and free lists.

The Congress in 1945 enlarged the President's power by authorizing him to cut tariff rates again, in the amount of up to 50 percent of the rates in effect on January 1, 1945, or by as much as 75 percent of the rates in effect in 1934.

At the end of World War II, the President commenced negotiations simultaneously with 22 other nations for the mutual reductions of trade barriers. Negotiations were carried on in Geneva and in 1947 resulted in what is known as the General Agreement on Tariffs and Trade, or GATT. Since that time, membership in GATT has grown to over 70, and negotiations resulting in relaxation of trade barriers have been held several times.

Further support of liberalized trade came in 1962 when Congress passed President Kennedy's Trade Expansion Act. The Act authorized what is now known as the Kennedy Round of trade negotiations and allowed the President to reduce tariffs to zero. The Kennedy Round negotiations were not as successful in bringing about generally reduced tariffs as had originally been hoped, but some reductions of the rates on forest products were significant.

During the development of a more liberal U. S. trade policy there have been numerous setbacks through the years as special interests continue to seek protection. However, since the economic self-interest of the man in the street requires a free trade environment and since more and more of those "men in the street" as well as their elected officials have become sophisticated enough to reject the idea of protection via tariff subsidies, the trend toward liberalization may be expected to continue, however haltingly.

In relating the development of U. S. trade policy to forest products, it is interesting to compare the 1930 Smoot-Hawley rates on selected items with the post-Kennedy Round rates. This is done in Table 1.

It is apparent that for many forest products items tariffs have never been a real problem. Lumber, wood pulp, and newsprint are Canada's major forest products imports to the U. S. and have been for many years. On the other hand, there is virtually no trade in plywood, which still carries a rather high tariff for a commodity item.

Table 1. Comparative tariff rates, 1930 and 1972 [1]

Item	Tariff	
	1930	1972
Softwood lumber	$4/thous. board feet	free
Birch & maple veneer	20%	4%
Softwood veneer	20%	5%
Softwood plywood	40%	10%
Wood chips	free	free
Wood pulp	free	free
Newsprint	free	free
Paperboard	10%	free
Logs	free	free

This is, in a very general way, the manner in which U. S. tariffs have shaped the forest products trade with Canada. Two special problems relating to trade and trade-related policies of the U. S. will be covered in the following sections.

A Log Export Ban—Ramifications for U. S.-Canadian Trade

Every period of strong demand for housing in the U. S. and the high building materials prices that are a consequence of that demand have in the past few years elicited appeals from a variety of special interest groups for a ban on the export of logs from the U. S.

Log exports in 1972 amounted to over 3 billion board feet, most of which went to Japan, a country incapable of supplying its own timber demands at reasonable prices. A log export ban is undesirable for a number of reasons, all of which are well known. The U. S. balance of payments would be adversely affected, progress toward further liberalization of trade with Japan would be hindered, and the loss to the U. S. of the export income would have a multiplier effect in its impact on GNP. In addition, it is unlikely that a ban would have the effect on prices hoped for by its proponents.

The call for a ban comes from wood products manufacturers, primarily those who own little or no timber, and from the users of wood products. Their line of reasoning maintains that if logs are not exported, they will be made available to domestic mills, and that as a consequence of this increased supply, the prices of both logs and finished products may be expected to fall. Various environmental groups find themselves in the strange position of being allied with wood processors and users on the question of log exports. However, the environmentalists perceive a ban on log export as having a somewhat different result than the other proponents of a ban. They believe that the logs which are being exported would be left standing in woods if exports were banned. Both of these lines of reasoning make the implicit assumption that the U. S.-Japanese forest products trade is merely a two-party trade—that there are no other parties with which either party may trade. This is, of course, incorrect. Both Japan and the U. S. enjoy a vigorous and well established products trade with Canada.

The U. S. may be a large net exporter of logs, but it is a net importer of all forest products in total and of lumber in particular. In 1971 for example, imports, in terms of physical volume, were more than double exports for all forest products in total. In the case of lumber, imports were more than six times the volume of exports [7]. It is reasonable to suppose that under these circumstances, if the supply of U. S. logs to Japan should be shut off, the Japanese would probably look to western Canada as an alternative source of supply. They would compete with the U. S. for large quantities of wood, both manufactured and in the form of logs, which now constitute an important portion of the U. S. lumber supply. The gain in available domestic wood volume resulting from a log export ban would likely be offset by a loss in Canadian imports, and the resulting U. S. price structure would probably show little change. In addition, the U. S. would have lost export income while Canada would have maintained its export position. Canada and Japan would be as well off as before such a ban, and the U. S. would be a net loser.

Impact of the U. S.-Canadian Exchange Rate

Continued health of U. S.-Canadian trade relationships, particularly with respect to commodities such as forest products, depends on a favorable exchange rate relationship between the Canadian and U. S. dollars. Should the Canadian dollar increase in value relative to the U. S. dollar, U. S. imports of most forest products from Canada are apt to suffer. Although the two currencies have been floating at close to parity for an extended period of time and are probably at an equilibrium level in the current trade environment, it is quite conceivable that the relationship could undergo an adverse change in the future.

Canada has large stores of oil and gas which the U. S. may import on a large scale in the event that Canadian authorities should approve such a trade. If this trade does develop and if exports from the U. S. to Canada do not increase by an amount large enough to offset those imports of oil and gas, it is likely that the U. S. will develop a very sizable deficit in its trade with Canada. In that event there would be a strong upward pressure on the value of the Canadian dollar in terms of the U. S. dollar. I have not attempted to estimate the magnitude of the revaluation that would occur under those circumstances, but something in the range of five to ten percent is not inconceivable given the projected energy requirements of the U. S. Those connected with the Canadian forest products industry might ponder for a moment the effect that five or ten percent decrease in product prize realization might have on the business, particularly when U. S. market prices for forest products are at cyclical lows.

There are some offsetting factors, however, which may serve to alleviate the exchange rate problem. Given the current climate of world trade liberalization, it is not unlikely that Canadian barriers to U. S. exports may come down to an extent great enough to allow U. S. exports to offset the adverse effects of U. S. gas and oil imports. In addition, it is worth noting that the rate of inflation in Canada has exceeded that in the U. S. for a number of years. Should this trend continue, it will tend to depress the value of the Canadian dollar relative to the U. S. dollar.

U. S. Demand for Forest Products

It is probably apparent by now that the title of this paper is somewhat of a misnomer. U. S. tariffs have been removed from most commodity forest products, and at any rate they have been negligible for some years. There is always a danger that a trade war will develop in the western world and that significant tariffs or quotas may be imposed again in the future. However, given the economic climate of the world today, the probability of this eventuality must be rated as low. There is a growing realization in the developed and developing nations that international trade cannot be impaired without impairing economic growth.

Trade policy *per se,* then, has not been in recent years nor may we expect it to be in the foreseeable future the primary factor in determining U. S.-Canadian forest products trade patterns, with the exception of the high tariff on softwood plywood imports. Rather, the overriding factors influencing those trade patterns are apt to be economic, specifically, the demand for forest products in the U. S., Canada's closest trading partner, and competition for Canada's softwood exports from other wood-importing nations.

With regard to the U. S. demand for forest products, it is interesting to note the general relationships which have existed in the past. U. S. imports of Canadian softwood lumber have generally followed U. S. lumber consumption patterns, which are primarily a function of housing construction activity. For example, the years 1971 and 1972 were characterized by sharply increased residential construction, with housing starts reaching a high of 2.4 million units in 1972, up from a cyclical low of 1.47 million units in 1970. During the same period, softwood lumber imports from Canada rose by about 40 percent, from 5.7 billion board feet in 1970 to 8 billion board feet in 1972. The same general pattern holds true for other periods of increasing construction activity, such as 1961–63 and 1967–68. Conversely, the interim periods of decreasing construction activity are characterized by a drop in Canadian lumber imports.

The long term trend in softwood lumber imports from Canada is up, those imports having quadrupled in the past 20 years, a period when domestic softwood lumber production has increased only ten percent while consumption has increased by over 30 percent [2]. Presumably, a large portion of U. S. timber resources has been diverted to softwood plywood production in this twenty year period, that production having grown by about 320 percent from 4.4 billion square feet (3/8″ basis) in 1952 to 18.5 billion square feet in 1972 [2]. Clearly, Canadian imports have filled a gap created by diversion of manufacturing activity in the U. S. to plywood, which, as you will recall, is protected by a 10 percent tariff barrier.

As for pulp and paper imports, they seem to be losing ground to U. S. production in the long run. They have grown during the past twenty years at a rate of about 3 percent per year, which is somewhat less than the rate by which the consumption of paper and board has increased, about 4 percent per year [5 and 6]. This latter rate of increase, incidentally, closely approximates the real rate of economic growth during the period. Pulp and paper imports exhibit some cyclicality in terms of volume, which generally speaking reflects the cyclicality in the U. S. economy.

What of future demands for forest products in the U. S.? Demand for softwood lumber and plywood is expected to increase at a moderate rate in all end use markets through the end of this decade. Average annual lumber consumption for the years 1973–80 is expected to exceed 43 billion board feet, compared with an average of 34 billion for the 1965–72 period, a 27 percent increase. Average annual plywood consumption for 1973–80 is expected to exceed 18 billion square feet (3/8 inch basis), compared with an average of 14.4 billion for 1965–72.

New residential construction is the single most important factor underlying the expected shift in demand. For the years 1973 through 1980, new units started are expected to total over 16.6 million, an average of nearly 2.1 million per year. This latter figure compares with an average of less than 1.6 million for the years 1965–72. Demand for new housing units depends upon a variety of factors, including availability of credit as manifested in mortgage interest rates, the costs of purchasing and maintaining a home, per capita disposable income, and net new household formations, among others. The last of these, net new household formations, is by far the most important determinant of the long run trend in the demand for new housing units.

The U. S. Department of Commerce has developed projections for the number of households through 1980. The average year to year increase in the number of households during the 1961–71 period was 1,067,000, whereas the average year to year increase for the 1972–80 period is expected to be 1,419,000 or 33 percent greater than the former figure. Underlying the expected increase in household formations during the seventies is a basic shift in the age mix of the population. This is coming about through the entry of the children of the postwar baby boom into the 25–34 year age group, the age bracket in which people are most likely to form new households. The size of this group was actually stable or declining during the fifties and the first half of the sixties. Moderate growth began in the mid-sixties and accelerated in the late sixties, reaching its highest rate in 1972. The rate of growth experienced in 1972 will be approximately equalled during the remainder of the seventies.

I have not attempted to develop estimates of year to year fluctuations in residential construction activity, which are largely a function of credit availability and general economic conditions. This is an area best left to the more heroic macro-modelers.

The demand for pulp and paper is expected to continue growing at an average of 4 percent per year, keeping pace with economic growth. However, the supply situation in pulp and paper is interesting from a foreign trade standpoint. While demand continues to grow at 4 percent per year, and probably more in 1973, planned capacity expansions in the U. S. pulp and paper industry are somewhat less than 1.5 percent for 1973 and 1974. This figure is unlikely to be exceeded, since it takes a minimum of two years to plan and construct a mill of significant size. In addition, the cost of pollution control equipment has increased significantly the investment required for a mill of given size, to the extent that significant capacity expansion will probably not take place for several years. All of this bodes well for any nation which has export capabilities in pulp and paper. The U. S. will probably be a fertile market for some years to come.

Impact of Expanded World Trade

From the standpoint of trade policy and U. S. supply-demand factors, the outlook is for a continued and increasing U. S.-Canada forest products trade, that is to say, more of the same. However, there is another factor to consider—the rest of the world.

It is likely that the world is on the verge of a significant expansion of international trade. The cold war has ended, militarily and economically, and probably politically. Armed conflict situations and offensive and defensive weapons levels will be negotiated out because the major powers will not tolerate further threats to their economic well being. Total military expenditures, in the neighborhood of $300 billion per year, worldwide, are going flat and may well decrease, owing to the pressure for social capital investment in most nations.

The socialist markets are opening up. Together, Eastern Europe, Russia, and China have a combined population of 1.1 billion people and a combined GNP in the neighborhood of $750–800 billion per year. The ending of the cold war in economic terms means that all of the socialist nations have become markets for all manner of goods and areas for capital investment. Long term credits can and are being made available to facilitate such trade. None of this has been true for over 25 years.

In addition to the socialist nations, it is worthy of note that the industrial revolution is accelerating in many of the developing nations, such as South Korea, Taiwan, and several of the Latin American countries. These nations are experiencing real growth rates of from 5–10 percent per year, compared with growth rates of 3–6 percent in Western Europe and North America. As the trend continues, these nations will become increasingly more important as partners in international trade.

All developed and developing nations will benefit from the expanded trade, but there are apt to be some shocks along the way for users of particular commodities. For example, as the world market becomes a larger world market, it is quite conceivable that there will be a great deal more competition for Canada's softwood lumber output than at present. And, we may find that softwood lumber in a larger world market is no longer a cheap commodity.

The foregoing remarks are largely speculative. A bit more material at this point in time is the increasing demand for softwood lumber in Japan. The Japanese government has set a goal of 9.5 million housing starts for the five-year period starting with 1973, in order to upgrade the nation's housing inventory. It is worth noting in this regard that building codes allowing North American style frame construction have been adopted in several Japanese cities, and it is likely that more will follow suit. This is significant because it will create a demand for U. S. dimension lumber, a demand which could, along with increased demands for traditional Japanese specifications and for partially manufactured lumber, alter the pattern of U. S.-Canadian lumber trade.

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Seminar Session 3.0

INTERNATIONAL TRADE POLICY IN FOREST PRODUCTS: CANADA AND THE UNITED STATES

Subsession 3.1—Trade Policies for Specific Forest Products

Papers: E. A. F. Wetton, Canadian Forestry Service, Ottawa, "Factors Affecting Softwood Plywood Trade in North America"

Barney Dowdle, University of Washington, "Trade on Raw Materials: The Concern for Logs"

Subsession 3.2—Land Management Implications of Forest Products Trade

Papers: Glenn H. Manning, Canadian Forestry Service, Ottawa, "Management Alternatives to Meet Future Demands on Canada's Forests"

John H. Beuter, Oregon State University, "Competitive Forces Influencing Land Use: Public Lands and Public Policy in the U. S."

Seminar Session 4.0

RESPONDING TO AN EXPANDING CLIENTELE: EXTENSION IN CANADA AND THE UNITED STATES

CHAIRMAN: W. NEILL SCHALLER, Farm Foundation, Chicago

Agricultural Economists Responding to an Expanding Clientele

H. H. AUSTMAN

THE CARRYING OUT of agricultural extension becomes one of the important roles of agricultural economists. In fact, it is the route through which research and expertise in the subject area become utilized and applied. Likewise, modern day extension requires the support and active inputs of agricultural economists. My intent is to review briefly the history of the development of extension in Canada, the initiation of agricultural economics extension, or more specifically, farm management extension; to explain how this area is defined in different parts of Canada; and then to discuss briefly the past and present trends in the serving of the clientele. I realize that the major topic is "Serving an Expanding Clientele" and I hope to devote a fair amount of my time to that, recognizing that some discussion on history and definition has a direct implication on clientele.

I recognize the challenge before me in acting as the Canadian speaker on extension at this important occasion. Therefore, for support, and for some added depth, I wrote to administrators in each of the ten provinces who were responsible for extension (Directors of Extension). I asked three questions concerning historic development of extension, definition of farm management extension, and priority clientele.

Replies were received from eight of the ten provinces. This cooperation was much appreciated as it added considerably to my understanding of the subject. I hope that I can share this information with you and some of my own views. This is *not* a research report and the replies are conditioned by my own interpretation.

History

Extension work began in Canada early in the century over a period of almost twenty years. It started at different times in different provinces. Ontario was first with a beginning in 1907 which was a joint effort between the Departments of Agriculture and Education. In 1912 it was made fully an Agriculture Department responsibility. In the West, extension got underway around 1913, and in the Maritimes, in the early or mid-twenties.

In all cases, the beginnings were quite similar. At first, certain services and information were provided from a central office (the capital). Very soon however a field staff was established, referred to as Agricultural Representatives or District Agriculturists, that was similar in focus to the county agents in the United States. The philosophy of these early front line forces was generally to get out among the farmers and do what was needed to help them improve their operations. It was largely production oriented—to make two blades of grass grow where one grew before.

Farm management extension as an identified part of the extension services seemed to get underway across the country in the 1950's. In most of the Maritimes and Ontario, it was the early fifties; in the west, it was during the mid- and late fifties. In one or two provinces it did not begin until the early sixties. This was when specific farm management divisions or sections of the departments were organized and staffed by agricultural economists, bringing new emphasis on maximizing returns from the farm resources. In some cases, these agricultural economists sections ran their own program emphasizing farm accounting and analysis, but,

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in most cases, they operated as specialist support staff to the field extension staff.

Probably the significant difference between the historic development of extension in Canada versus development in the U. S. A. was the jurisdictional base. In the United States it was national legislation such as the Smith-Lever Act which declared that extension work would be carried out in all states, supported by the USDA and implemented by land grant colleges. In Canada, the British North America Act declared that all educational activities were the specific responsibility of provinces. Extension, being defined as education, thus became a provincial responsibility. Agricultural colleges or universities were organized under the provincial system, and, in most cases, the first agricultural college was entirely financed by the Provincial Department of Agriculture.

Agricultural college staff had been busy doing some extension work in many provinces quite some time before the dates mentioned when formal extension services were organized. Only in one province did the agricultural college continue to play a very significant role in agricultural extension, and this was Saskatchewan. In fact, it developed a strong enough agricultural extension arm that it still plays a significant role in extension in close cooperation with the Saskatchewan Department of Agriculture. Most agricultural colleges do contribute significant background, expertise, consultation, and occasionally front line work to extension. Perhaps agricultural colleges do not get as much credit as they deserve in agricultural extension. Certainly in farm management extension, college staff was very supportive and helped greatly in stimulating agricultural departments in developing divisions or sections devoted to farm management. In fact, in many cases, they participated in the initial front line delivery of extension programs.

I am sure that when extension was being developed in Canada, examples were brought in from the United Kingdom, but, at the same time, there was a good deal of looking across the border to the examples set by our U. S. neighbors. Nevertheless, Canadian Extension does have a uniqueness of its own.

Definition

It would appear that many or most provinces initially defined farm management extension as primarily farm business management, considering mainly the financial and business aspect of farming. However, there have been some marked changes in that definition. In provinces like British Columbia and Ontario, they have for some time now considered the total farm operation—business and production on the farm—as being within the scope of farm management extension. In other words, it is the broad interpretation of the management of crops, livestock, machinery, and finances.

The other provinces are presently swinging toward the broader definition of farm management extension. For instance, in the west there is increasing emphasis on production management by farm management extension and on an interdisciplinary approach to farm problems which puts the farm management specialist or the agricultural economist on the team with specialists in livestock, crops, and agricultural engineering to develop certain programs or solve certain problems. To me, this is a wise approach in that it brings together the various expertise and disciplines to bear jointly on a problem rather than separately. Let me quote from a maritime province:

> The concept of farm business management which this Province has accepted covers an expanded spectrum which includes managing financial and physical resources, maintaining and analysing records, purchasing and marketing effectively, communicating and evaluating farming practices and regulations pertaining to production and marketing.[1]

Just this trend to the broader definition of farm management extension has definite implications on enlarging clientele. In fact, the agricultural economist is beginning to work much more with his colleagues from other agricultural disciplines. I should not say "beginning to" because I believe it was often through the economists' demonstrated expertise and leadership in interdisciplinary problem-solving that this approach has been growing. So, if this approach is beginning to increase demands on your time, be aware that it may have been brought on by yourselves. However, it is a good approach.

The change in definition from a somewhat narrow or highly specialized one of "financial and business management" to the management of the total farm operation, production, marketing, and finances probably has greater implications on the role of the agricultural economist in extension. Some provinces, such as Ontario, New Brunswick, and British Columbia, indicate that they expect all their staff to carry out farm management functions. All provinces expect their staff in the field especially to have a definite farm management orientation. This does not mean that each is a farm management specialist, although Ontario is pressing in this direction. It does mean that agricultural economists face an important challenge in providing orientation and in-service training to both the extension generalists and production specialists. Most provinces report considerable activity of this sort over the past several years.

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[1] The quotations in this paper were taken from the replies, mentioned earlier, of the provincial administrators responsible for extension in response to the inquiry concerning historic development of extension, definition of farm management extension, and priority clientele.

At any rate, whereas agricultural economists were initially much involved in teaching farmers accounting procedures and financial management techniques, they have now come into greater demand in helping their extension colleagues in teaching and applying farm management principles to all aspects of the farm operation. This change places quite a new dimension on the scope of knowledge and expertise expected of the agricultural economist.

Clientele

It is difficult to pin down the direction most provinces are going with respect to priority clientele. Perhaps it is because across the country we are in somewhat of a transition from the traditional clientele of reasonably early adopters and the more highly commercialized farmer, to the beginning and developing farmer.

A couple of provinces are quite clear on target clientele. Ontario directs its agricultural extension programs at the commercial farmer—those with annual gross sales *over* \$10,000. (It should be remembered here that Ontario has a rural development service directed largely at farmers under \$10,000 sales). Manitoba states clearly that its priority farm clientele are those with gross sales *under* \$15,000 per year. This does not mean that farmers with over that amount are turned away—after all, the extension office is a public office. All other provinces heard from indicate a shift in the past few years with a growing concern for the smaller lower income farmer and for the maintenance of the family farm.

In almost all cases, the earlier approach has been one of an open door policy, helping those who come in the door and want help. This was usually the commercial or almost-commercial farmer. The less aggressive, lower income farmer seldom sought advice in the sophisticated and somewhat academic area of farm management. If he came, he wanted specific answers to specific production questions. Now governments are saying (regardless of political stripe) that extension must do a better job of selecting *target* clientele and that those should be somewhat different (or vastly different in some cases) from the traditional clientele.

Let me illustrate by a couple of quotations from two widely separate provinces:

> 1. Since 1971, there has been increased direction toward helping the farmer at the lower end of the scale. The present government is committed to maintaining the family farm and very concerned about the declining farm numbers.
> 2. The major emphasis is on the development of the farmer in the lower end of the commercial scale, the young farmer and the low income farmer interested in expansion.

Both of these statements follow explanations of the open door policy—service to all those who sought it—recognizing however that the majority of seekers were commercial farmers. Therefore, the trend can be noted, and it suggests somewhat of a dichotomy.

This has definite implications to the role of agricultural economists in terms of training, time allocation, and working relationships with other staff. Firstly, this trend can be frustrating: staff who have for some time had very satisfying working relations with the more sophisticated farmer (who is appreciative of their efforts) are suddenly confronted with working with clients who have much more difficult problems and are often suspicious and nonappreciative of extension or government efforts. So, there can be considerable slippage in time and efforts.

Secondly, the task can be more difficult. We have had much experience over the past working with so-called commercial farmers. To change to a lower income clientele raises new challenges because of usually lower educational attainment and a less sophisticated approach to things. There is some question in fact about whether a highly trained academic can relate effectively to these people. In Manitoba we are saying that it is difficult at best, and, therefore, for advising the smaller developing farmer, we employ persons with practical farm experience and only two years of agricultural training. We then provide special in-service training and back them up with farm management expertise. Some will argue that this approach is less than professional, but I would argue that it can make the professional input of the agricultural economist more meaningful and effective.

Thirdly, the shift in clientele opens up to much larger numbers than we have been accustomed to. Very roughly, we can say that perhaps two thirds of the farmers are in a lower income category, e.g., under $10,000 annual gross sales. Therefore, it may be said that we have been working with a select clientele—a minority of the farm clientele. Studies have shown that extension was doing well when it reached 35 percent of the farmers. Experience over the last two years has shown that when special efforts were made to reach the subcommercial farmer, mainly they were *new* clientele.

As I see it, therefore, agricultural economists face a challenge in providing an effective service to a new and expanding clientele. This will require:

1. *Some new knowledge and expertise to deal with the unique problems of new and developing farmers.* Agricultural economists have been accused of being overly academic—perhaps at times unfairly accused. Working with new and developing farmers means teaching and discussing at a different level of sophistication, providing more fundamental information at a practical level, and less reference to theory.

2. *More interdisciplinary work in planning and program development with the other agricultural disciplines.* This includes the development of complete packages of production and management information for use by front line staff and by farmers. Agricultural economists, to have the greatest effect, must apply their knowledge either through or jointly with other disciplines. Economics can be relatively ineffective if kept to itself as a separate and lone discipline. The interdisciplinary approach is necessary to assure the application of economic principles to farming, farm development, and solving farm production, marketing, and management problems.

3. *The willingness and ability to delegate to others who are often not trained in agricultural economics to carry out the extension job.* This, of course, includes the required orientation and training of these "others." Delegation is not easy. It means coming out of any academic shell that may exist and being prepared to hand over sometimes cherished subject authority to others who may be considered of lesser professional status. It also means providing the necessary basic training for them to do the job—not trying to turn them into economists.

I have not discussed the expanding clientele brought about by new demands from agribusiness and the various agencies serving agriculture. This is also a significant issue. Also, I have not mentioned increased demands of commercial farmers for consulting services in farm management, brought about in part by some withdrawal of extension. (This may not be considered an extension function.) There are other factors, e.g., the potential contribution of agricultural economics in the broad area of rural development. However, it seems to me that the main concern of the provincial governments in Canada at present is expanding the farm clientele with emphasis on developing farmers.

Let me close by saying that I have faith in agricultural economists being able to meet new challenges that face them. They have much to contribute to agriculture and rural society through the extension medium. It is easy (and comfortable) to slip into ivory towers. Extension will require an increasing contribution from agricultural economists in the form of new and changing services and knowledge, together with the ability to help an expanding agricultural and rural clientele.

Seminar Session 4.0

RESPONDING TO AN EXPANDING CLIENTELE: EXTENSION IN CANADA AND THE UNITED STATES

Paper: Jean C. Evans, Oklahoma State University, "Responding to an Expanding Clientele: Extension in the U. S. A."

Viewpoint: Kenneth D. Duft, Washington State University, "Clientele Selection, Political and Financial Support"

Canadian Counterpart: H. D. McRorie, Royal Bank of Canada

Viewpoint: Gordon D. Rose, South Dakota State University, "Program Determination and Evaluation"

Canadian Counterpart: D. M. Bowers, Canada Department of Agriculture

Sectional Meeting H

PUBLIC SECTOR RESEARCH AND EDUCATION AND THE AGRIBUSINESS COMPLEX: UNHOLY ALLIANCE OR SOCIALLY BENEFICIAL PARTNERSHIP?

Introduction by the Chairman: DALE E. HATHAWAY, Ford Foundation

IN OUTLINING the assignment for this session, President Castle suggested that I try to place the discussion in context beyond that merely suggested by the title. As you will see, one of our participants, if he follows his draft paper, thinks we failed to specify the topic adequately. In hopes of diverting him from that ploy to avoid discussing the issue, I shall try once again to outline the issues I think we should be discussing.

At present it seems to me there are two theories regarding the public sector research output that are in vogue and largely, if not totally, inconsistent. One is the Hayami-Ruttan theory of induced innovation, which relies on an invisible hand to produce research that responds to factor prices and serves to public good via the appropriate institutions. The other view is best typified by *Hard Tomatoes, Hard Times*, which can roughly be described as a conscious conspiracy between agribusiness and the public sector research to produce research whose benefits accrue to the benefit of the largest and the most wealthy and which in fact is detrimental to the average citizen.

Thus, as I see it, there are three questions to be addressed:

1. Has the research output in the U. S. been strongly biased in favor of the favored? If so, what is needed to redress the imbalance, including the possibility of a sharp reduction in public funding of agriresearch that is largely for the benefit of large firms?

2. If such a bias has existed, has it arisen because the public research system has become totally dependent upon and, therefore, only answers to agribusiness in order to achieve political support for appropriations?

3. If such biases occur, are they in part the result of a self-included reward and punishment system which the public sector allows the private sector to impose in the form of giving or withholding grants, consultantships, and other individual "goodies"?

The procedures were as follows:

1. The chairman introduced the topic and the panel.

2. Each panelist had up to 15 minutes to present his views.

3. There was widespread discussion between the audience and the panel, which is inadequately summarized by the chairman and included with the panel papers.

Discussion: HAROLD F. BREIMYER, University of Missouri, Columbia

To pose the title topically: How can the profession of agricultural economics avoid having its own Watergate? In a different sense, and paraphrasing the Biblical line: many may be called, or feel themselves called, to scientific endeavor, but few qualify.

Years ago Maria Edgeworth capsuled scientific endeavor in whimsical words as she told about how those patriarchs of economics, Ricardo and Malthus,

> hunted together in the search of Truth and Huzzaed when they found her, without caring who found her first; and indeed I have seen them both put their able hands to the windlass to drag her up from the bottom of that well in which she so strangely loves to dwell [5, p. 134].[1]

At the other extreme of time and scholarly distinction is a line from a paper I gave a couple of years ago. Having become convinced that few persons are cut out to be scientific observers, I commented as follows about differences in graduate students' research capacity. Those differences, I said,

> have little to do with technical competence. . . . They concern the sense of detachment, the curiosity and capacity to observe phenomena

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[1] Credit for this rare citation is due Paul Nelson of ERS, USDA.

> selflessly. The egocentric is a poor candidate for a research assignment. . . . The image of the detached, unworldly, selfless scientist is not celebrated just now but it has much to commend it. [1, p. 2]

Jacob Viner, an eminent scholar, has stood in critical judgment of how well economists live up to what they profess. On one occasion he wrote, with respect to "scientific" or "scholarly" objectivity,

> . . . science . . . does not impress me as being strikingly more objective than *some* theological writing, old and recent, I know, or even than some poetry I know. [6, p. 442]

In his 1962 Richard T. Ely lecture (the first ever) Viner remarked:

> I am . . . impressed by the extent to which vested interests and going institutions seem to have the power to generate ideas congruent with themselves. [7, p. 1]

Then he noted:

> . . . the emergence of a variety of kinds of economists, so that no layman needed to be at a loss in finding some school of economics which provided him with professional justification for whatever policies he was attached to . . . . [7, p. 13]

The five quotations sum my thesis. That thesis is that although most agricultural economists see themselves as looking for Truth they display shortcomings in doing so. The enterprise is more mettle-testing than they know and the personal qualifications rarer than they acknowledge. Temptations to compromise are by no means absent. Moreover, agricultural economists are timid about admitting either intrinsic or enticed inadequacies. Their taciturnity on this subject contrasts with their wordiness on just about any other.

Though agricultural economists may wander from the straight and narrow, by and large they do so guilelessly. Few of our colleagues sell their soul for a bowl of porridge. They give it away. They fritter it, concession by harmless concession.

An analogy with criminality fits. Of the sum total of illegal acquisition of money, more is accounted for by ordinary folks fudging and filching than by robbers holding up banks. More misrepresentation of knowledge traces to scholars who let their ideology bias them or who pursue false paths to fame, than to those who perjure for profit. Few economists are equipped and disposed to drag Truth from her well.

Categorical Elitism

I now turn to institutional influences on private performance. I confine these remarks to the subtle sanctions of our professional peers, and the many attractions and pressures coming from or via our patron institutions for public sector research and education, principally the Land Grant universities and the U. S. Department of Agriculture.

Peer group professional standard-setting is a force of no mean moment. We jointly set our terms of elitism. They can be wise or unwise, and we ought to recognize the possibility of the unwise. My one objection to the awards program of this Association, which I generally support, is that it too often telegraphs that a display of erudition or mathematical wizardry is our mark of professional distinction. I regard the message as false.

The assigned title to this symposium features the agribusiness complex. With regard to definition of excellence, I believe our agribusiness component exerts a good influence. It helps to keep our professional output "relevant," if that exorcised word be reinstated this one time. My only complaint is that our agribusiness colleagues are not as cooperative as they could be in feeding raw data into our analytical processes.

Scholarly Inquiry and the Multiversity

In agricultural economics, the predominant public institution for research and teaching is of course the USDA-Land Grant University complex. With respect to the Land Grant university or multiversity, my capsule judgment is that it faces a crisis in internal government and public support, and further that university scholars stand in grave danger of confusing claims to administrative autonomy, which are indefensible, with those to academic integrity, which must be defended vigorously.

Opportunities and subtle inducements to nonobjectivity in research, teaching, and extension are legion. In extension, there is the lure to confine one's work to the literate and responsive audience. This has been muckraked lately. Extension policy work, in which I engage, offers a different kind of temptation. It is to cater to the prejudices of our clientele. For instance, as one who has long defended the position of atomistic farming against concentrated industry, I am occasionally appalled at how lacking in benevolence farmers can be. They ask the right to organize for collective bargaining but reject bargaining by hired farm laborers.[2] As another example, for some established farmers the burning goal seems to be to buy out as many of their smaller neighbors as they can. Furthermore, occasionally they ask a licensing system that would insure their success in doing so. Seldom does anyone inquire for the welfare of the displaced individuals.

What is the extension economist to do? Is he to duck such issues, or to parry with a pointed word or two? He is an educator, is he not? Does the word have moral connotations?

The most obvious challenge to the integrity of the university and its scholars is private funding of research, either institutionally or as private consulting. These are alike in that both compromise the basic role of the Land Grant university. That role is to spread knowledge, to make it a public good. Any selective dispensation for private advantage violates the institution's purpose, its reason for being. In a summary word, to the extent the Land Grant university and its resident scholars turn cozy and calculating, they are faithless to the institution's charter and invite its demise.

These harsh words do not reject all privately funded institutional research. They do call for limiting the amount and examining the content with utmost circumspectness.

Who invites the university to undertake projects that compromise its role and perhaps even its academic integrity? Just about anyone. Agribusiness firms and organizations are some who do. But, larger farmers and organizations of smaller farmers are capable of the same thing. I do not couch these warnings exclusively in terms of the agribusiness complex.

Instances of gross misconduct are, unfortunately, not absent. Years ago I was associated with a man who swore he was deposed as an Agriculture-College Dean because he refused to endorse an advertised mineral mixture for livestock. I could not verify his claim but can certify to his bitterness. Much later, a Congressional hearing recorded how an agribusiness grantor of research funds threatened to halt all further grants to a certain department of agricultural economics unless a research report then in process were withdrawn.

If I make selective concession on institutional research grants, I offer none on private consulting. Arising during the period of low salaries after World War II, the practice has survived under various meretricious apologetics. U. S. universities now pay full time salaries for full time service; and the public has a right to its *quid pro quo*. The first reason for objecting to it is the obvious, if unadmitted, one that financial interest can warp a person's judgment. The second one is that it conflicts with the mission of a Land Grant university. For my part, I try to respond to all requests that are within my minimum competence, irrespective of whether they come from the high-and-mighty or the humble, from the rich or the poor.[3]

But again, the more general threat to the integrity of university scholars is not that which is bought but that which is subtly induced. Some research and extension economists attach themselves to an interest group so tightly as almost to be indentured. Financial rewards may be absent. As an illustrative instance, one such person testified under oath to certain facts that, by implication, opposed a policy position of the commodity sector with which he was working. Life suddenly became hard for him.

I once had a commodity specialty, but no one ever owned me. No one ever will.

Scholarly Inquiry and the USDA

Those of us who worked devotedly for that grand organization, the Bureau of Agricultural Economics, have an especially sensitive ear for the cacophony that nowadays comes out of the USDA. It sometimes seems as though one needs a credibility index agency by agency in order to interpret USDA pronouncements. (For some agencies the index is still very high, I hasten to add.) Does the citizen of our democracy have a right to obtain honest, complete, and reliable information from the agencies of his government? Or is it both inevitable and acceptable that government agencies shall conduct themselves by rules of Machiavellian strategy?

The BAE was conceived in benefaction and matured in glorious service. It blighted because its people, to use words of Viner taken from another context, "as has often been the way of economists, . . . too often stepped on the toes of the powerful at wrong times . . ." [7, p. 5].

I have been disappointed by agricultural economists' failings in understanding principles of government. For lack of space I will only refer to my previous halting efforts to address the subject. In 1968 I pondered whether action agencies of USDA should be made an adjunct of the Department, so that their occupational tactics would not interfere with research, investigation, regulatory, and information functions [2]. Recently I have tried to develop concepts of government appropriate to services to the food and fiber sector of our economy. I look at the Executive Branch according to the analogy of planets in gravitationally-controlled orbit, not as a command mechanism. The persistent effort of the Nixon administration to convert the Executive Branch to a command organization, using Mr. Ash and his Commission's report as the lodestar, is in my judgment a frightening misadventure.

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[2] Some farmers and farm organizations have taken a more tolerant attitude recently.

[3] If an "honorarium" (a misnomer) is received, it goes to a student loan fund set up in my name.

Each agency has an organic commission and it must be faithful to it, any blandishment of the "President's men" notwithstanding. The late J. Edgar Hoover had a right to tell the President he could not use the FBI for his devices. Successive Administrators of the Economic Research Service have a right, nay an obligation, to announce the outlook for agriculture as it is irrespective of the political wishes of the Secretary, likewise the Administrator of the Statistical Reporting Service regarding crop and livestock conditions.

A proper field for economists' expertise is the principles for the government of government. Lacking space to develop this topic further, I refer to two of my papers, [4 and 3]. It may be noted that these date pre-Watergate.

Conclusion

In brief summary, to assure that scholars are both intellectually unbiased and professionally competent is not easy. Personal capacity for detached objectivity is an uncommon endowment, while inducements to compromise are many. Misdefining of what is excellent is the most pervasive error economists make. But the principal target of our concern is the Land Grant University-USDA organization. It has a unique charge. I have named some of the threats to its integrity; now I want to generalize about institutions. They seem to have a suicidal mania. No sooner do they reach a crescendo than they move toward self-extinction. They soften their resolve and bow before opportunism, elitism, and various other attractions, or what Coleridge called "this accursed practice of ever considering *only* what seems *expedient* for the occasion, disjoined from all principle or enlarged systems of action. . . ."[4]

In the relation between public research and educational institutions and the structure of the economy there is a sort of cosmic reciprocity. The organic acts of the USDA and of Land Grant universities were marvelously conceived to service an economy that was intended to be, and then was, plural, decentralized, or to use a mod word, decomposed. Where economic decision making is fractionated, economic power is diffused, and government is limited, publicly-provided objective knowledge is absolutely essential. It also can be provided readily, without serious threat to its scientific quality, given only that it receive adequate financial support. By contrast, where government becomes imperial and private economic power despotic, publicly supported research and education, particularly that of applied content, is neither possible nor appropriate.

Effective public service by economists of Land Grant universities and the USDA is essential for the survival of those institutions and necessary also for the survival of the kind of economic and political system the institutions themselves were called into being to serve. Perhaps incidentally, that kind of service is likewise essential for our own survival.

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[4] Quoted by Viner [7, p. 8].

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Discussion: GEORGE MEHREN, Associated Milk Producers, San Antonio, Texas

There is no programmed research or education in the public sector nor is there a programmed agribusiness complex that could make such words as "Unholy Alliance" even remotely meaningful. Some ten years ago some 16,000 agricultural research activities were classified in terms of purpose, commodity, or resource, and field of science. Yet this taxonomy merely imposed an *ex post* appearance of system upon unorganized activities. That apparent system is in fact no more than the accidental outcome of separate decisions atomistically made by many people.

Whether these public and private activities have in fact been socially beneficial may perhaps best be answered by comparison of the agricultural economies of Canada and the United States with those elsewhere. The agricultural economies of nations elsewhere are in every sense small, primitive, and unclean. Yet there is no compelling evidence that the operations generally called public sector research and education really had much to do with generation of an agribusiness complex so different from all others. Basically, agricultural research in the public sector appears still to be unplanned and unprogrammed and still really to be justified for budget in terms of claimed divine right or the ancient claim of the bottomless pit.

The planners of this program do not seem really to know the questions that are at issue here. Both planners have written that they want no "rehash of hard tomatoes, hard times"—whatever that means. They asked for "assessment of the public-private sector ties in the light of contemporary need"—whatever that means. They referred to the relation of public research and agribusiness "in terms of modern economic conditions within both." They inquire with respect to "distribution of costs and benefits at the present time." They ask if "programs and relations are as necessary now as in the past." Yet, they conclude that "at this point there is doubt that many of us know the most relevant questions for investigation." It is no crystal mandate.

Somehow it is easier to find answers if first the questions are specified. Absent structured questions, the alternative to usual research procedure, may be used to indicate the major attributes of public and private research and then to posit questions generated by the descriptive exercise itself.

Federally budgeted expenditures on research and development exceeded $16 billion by 1967, an increase of some 2,000 percent since 1940. In 1940, agricultural research was about 40 percent of total federal outlay. With larger absolute expenditure than in 1940, agricultural research in 1967 had fallen to 1.6 percent of the total. This massive expansion of public sector spending, along with major change in major attributes of the programs themselves, led to a variety of analyses by congressional, executive, state, and academic agencies. These evaluations have provided reasonably good classifications of public sector activity and somewhat less precise descriptions of activity by agribusiness enterprises.

In 1965, some 54 percent of agricultural research and development activity was funded by private agencies, including foundations. Thus public research was less than half the total. In that year agricultural industry funded $473 million and performed or expended some $460 million. The experiment stations funded $1[illegible] million and spent $227 million. USDA funded $213 million and spent $117 million. Other universities and federal agencies spent $365 million on research closely related to agriculture. Thus, USDA appears to be the only action agency that funded another research agent—the experiment stations. USDA and the experiment stations together spent 51 percent of their funds on production, 32 percent on marketing, 9 percent on people-oriented research, and 2 percent on research related to exports and to developing countries.

The $167 million spent by USDA were divided with 55 percent in biological sciences, 35 percent in physical, and 10 percent in social sciences. The $227 million spent by the experiment stations were divided by 78, 14, and 8 percent over the same categories. Industry spent its $460 million by distributing 31, 67, and 2 percent over these three fields. In total, the three groups together allocated 48, 47, and 5 percent to the three fields. Other universities and federal agencies spent 85 percent in biology, 9 percent in physical fields, and 6 percent in social sciences. Thus, industrial research allocations differed sharply from allocations of the other three classes of research agencies.

While activity or purpose classifications were imposed long after most projects had been initiated, there were substantial differences in allocations among the four sets of agencies funding and performing research as shown in Table 1.

Table 1. Percentage distribution of research outlays among specified activities (1965)

Activity	All	Industry	SAES	USDA	Others
	Percentages				
Resources and Conservation	6	1	10	13	10
Crops and Forestry	44	42	41	53	4
Animal	20	15	30	19	64
Agribusiness	19	34	2	3	<1
Human Needs and Development	3	2	5	6	8
Unallocated	8	6	12	6	14

The major difference in research emphasis is also indicated by approximate allocations of scientist man years over specified program goals of the USDA as shown in Table 2.

These data indicate again that USDA and SAES heavily emphasize the production fields. Agricultural business emphasizes business. While there really is little actual programming and even less coordination of programs—and no evidence either of unholy alliance or conscious service of social welfare—the three groups do appear to differ sharply in purpose and performance.

Basic research, not oriented to mission, is estimated to have encompassed about one third of total activity. Again no planning appears to have governed this set of activities. Rather, as for most others, interests and competence of individuals appear to determine these divisions of aggregates. No analysis of the interrelationships of basic and applied activity seems to have been made. Yet as a general observation, research in the public sector seems to show very little tie to resolution of research questions as basis for policy or operation.

Unplanned, undirected, and uncoordinated as they are, the thousands of research activities reflect concentrations that indicate sharply different interests. The business emphasis on business is easy to understand. That 80 percent of public research centers on farming indicates clientele as well as individual interest. Funding of public research is a political process, both informal and with respect to government allocations. Experiment station people avail of most known forms of political representation. Allocations do in fact seem to mirror political objectives and potency. Even so, it is doubtful that individual workers are pressured to do or not to do things out of keeping with their own priorities.

It does appear that in general those whose interests coincide with politically supported goals receive politically generated support. Yet there is very great latitude for individual decision and for unoriented research, especially in USDA but also in many commercial enterprises. Distinguished workers are generally recognized, but there is little evaluation of relevance of findings to missions within the public sector.

The translation of research findings into technology—if there be such translation—is not a process that has been evaluated with compelling precision and probity. Yet research here is unique, and somehow it is put to work. The revolutionary change in the American food economy since 1940 and the concomitant change in the general economy are clear enough. How, if at all, public and private research affected such

Table 2. Approximate allocations of scientist man years over specified program goals of the USDA (1965)

Goals	Approximate Number SMY			% of Total SMY
	USDA	SAES	Industry	
Natural Resource Use	700	500	500	7
Crop, Forest and Livestock Protection	800	1300	4000	23
Farm and Forest Production	600	2200	4000	27
Product Development and Quality	1000	750	5250	28
Marketing Efficiency	250	200	700	4
Exports and Developing Nations	100	150	250	2
Consumer Welfare	200	400	900	5
Rural Living	50	100	50	1
Community Environment	3	250	150	3

change is not really known. Productivity changes in areas of research emphasis are also amply visible, but no certain nexus to research has been established. Temporal interrelations are not in general known either.

Other apparent effects such as dislocation of millions of farmers and thousands of rural areas might reasonably be attributed to research findings. Actually no public or private activity has occurred in fields where answers are clearly necessary and still unavailable for systematic resolution of pressing economic and social issues here and in the world at large. Perhaps most revealing is that the judgments of more than 1,000 scientists result in virtually the same concentration patterns as those of 10 years ago.

There is remarkable vitality in the research community. Research methodology is still in revolutionary flux. Questions now are being engaged that go far beyond the scope of feasible analysis a few short years ago. The possible implications—of controlling life form determinants, for example—are literally staggering.

This presentation gives few answers to questions asked or unasked by the program planners. They do want questions. There are hundreds of those. Is there any measurable relationship of research, education, and economic or social change? Has research been planned for the past century? How in fact are resources allocated in public and private research? Can there in fact ever be real systems planning in research direction?

Is it necessary or useful or even possible that agricultural research be directed to missions? Is it really possible that net cost and benefit equilibrations be calculated for individual research projects or for research fields. Is program planning and evaluation an effective control mechanism for research direction or is it no more than after the fact classification?

Is it in fact possible to equilibrate benefit derivatives of research over operating goals that are not mutually consistent or where mission trade-offs occur? Do those who undertake research have any obligation to assure its useful application?

What are the benefit yields of agricultural research undertaken by commercial enterprise? Does an unequivocal profit target provide bases for allocation and evaluation not susceptible to use in public sector research? Is there any operational differentiation of so-called basic research from pragmatically oriented research? Is basic research really a necessary or useful basis for applied research or technological application? Is there really any feasible alternative to essentially political determination of mission priorities and of research allocations thereto?

Is there any measurable sequence of transition from so-called basic research to economic or social utilization of findings? Does such utilization itself affect the sequence? Is there any stable or measurable flow of information between private and public research activities and users thereof?

Are there complementarities or severe hostilities of private and public research? Are there questions which can be answered only by public or by private agencies acting alone?

This response to the question implicit in the strange title of this section is a diffuse confession of inability to answer. Even so, the research activity in agriculture has become large and often elegant. Common sense indicates that finding are used as major causal elements in a major process of economic and social change. The edges of current research go ever outward to questions that not long ago could not have been asked. Whether current research or that projected generates "social benefit" or is instead an "unholy alliance" can be answered only by preconceived normative biases. My biases yield an answer that is quite firm: *Research is worth supporting now and so long as man is curious.*

Discussion: ALEX F. MCCALLA, University of California, Davis

The title of this section suggests that questions are being raised about relationships between publicly supported research and education and the agricultural industry—supply, production, and marketing. I intend first to explore some possible reasons why such questions are being raised. Having done that I will discuss, largely in the context of Land Grant Colleges of agriculture, experiment stations, and extension services, our historic charges under federal enabling legislation, particularly the Hatch Act. My intent will be to give my perception of what our charge was and how we may have deviated from it. I will conclude with some comments about the social benefits and costs of public research and education *vis a vis* who pays. I will be approaching my subject from the point of view of an administrator at a Land Grant College and experiment station. This view, I believe, will be different from the one I would have taken a few years ago, when as an academic agricultural economist I would have viewed the issues with objective and moral candor unfettered by the real world of administration. Thus, my approach to the subject will be a mixture of the philosophical and the pragmatic.

Why should the issue of the relationship of the Land Grant-USDA research and education complex with the agricultural industry be a topic for serious discussion at this point in time? We all know that agricultural researchers pursue their various specialities with objectivity and detachment, completely dedicated to problem solving in the public interest. So, what is the issue? The issue is that we also know that researchers and research institutions are creatures influenced by economic, political, and social rewards and sanctions. Now we do have an issue, because if it is the perceived mission of the research and education establishment to serve a particular clientele, who that clientele is and how we interact with them is important. The nub of the issue then is who are we serving and who is paying the bill.

There are several possible reasons why this issue is of importance today. Let me list some of them quickly in no particular order.

1. The Land Grant-USDA complex has been subject to severe external criticism recently regarding both the quality and particularly the direction of its research. I am referring to the National Research Council Report, commonly known as the Pound Committee Report [5], *Hard Tomatoes, Hard Times* [4], Ralph Nader's studies, particularly the one on *Power and Land in California* [3], and continuing criticism in the press and the legislative halls in many states.

2. Public attitudes with respect to the value of higher education and publicly supported research have changed considerably from a position of unquestioned importance to one of placing these activities in direct competition for public support with other programs such as K through 12 education, welfare, the environment, etc.

3. Public commitment to the concepts of growth and efficiency at any cost have clearly changed. Issues of quality and distribution have risen in importance. For a set of institutions that have been almost exclusively dedicated to efficiency for 100 years, this changing emphasis is critical and traumatic.

4. Increasingly urban federal and state legislatures are asking new sets of questions regarding what is in it for their constituents by investing public dollars in agricultural research. They do not buy the lower food prices and better quality argument as readily anymore.

5. Increased financial pressures are causing the research institutions to establish priorities and examine costs. This raises directly the question of who are we serving and who should pay.

6. At the same time as the above shifts in public sentiment are occurring, our traditional clientele, the agribusiness complex, demands that we do more for them to save them from the "bird and bunny people," the land reformers and the consumer. Conversely, many disenfranchised clientele groups perceive (rightly so in my judgment) that they too have legitimate claims on the expertise of publicly financed research and education.

7. Finally, many people within the Land Grant-USDA complex are asking about the validity of what appears to them to be an indentured servant relationship with big agriculture.

All of these issues and more add up, in varying combinations, to demand reassessment of priorities and bedfellows—not that this is new. Jim Bonnen [2], Ed Bishop [1], and many others have called these to our attention much earlier, but it now seems to be a critical issue brought to a head, in my judgment, by *Hard Tomatoes, Hard Times*. The truth of the matter is that the study contains far more truth than many members of the Land Grant establishment are willing to admit. Calling it a "pack of lies and half truths" is the ultimate in "head in the sand" self evaluation. We must examine our relationship with particular clientele groups and that examination is long overdue.

So much for the charges. Now let me turn to what we are supposed to be and are doing. The Land Grant system was established to provide publicly supported teaching, research, and extension for the benefit of agriculture, rural America, and the general public. Its rationale over its period of birth (1862–1912) was that it was to serve people who were unable to conduct their own educational or research programs. It is instructive now and then to review some language of the Hatch Act [6] passed in 1887 which mandated the establishment of agricultural experiment stations. Section 2 as amended of that Act states that:

> It shall be the object and duty of the State Agricultural Experiment Stations through the expenditure of the appropriations hereinafter authorized to conduct original and other researches, investigations, and experiments bearing directly on the contributing to the estab-

> lishment and maintenance of a permanent and effective agricultural industry of the United States, including researches basic to the problems of agriculture in its broadest aspects, and such investigations as have for their purpose the development and improvement of the rural home and rural life and the maximum contribution by agriculture to the welfare of the consumer, as may be deemed advisable, having due regard to the varying conditions and needs of the respective States.

In the first half century from 1862 to 1912 the Land Grant agricultural complex concentrated on agricultural production. It tended to focus primarily on things—soil, water, plants, and animals—under the unstated assumption that if these were properly looked after and handled efficiently, human welfare on farms and in the cities would be served. It involved a clear dedication to the American goal of efficiency and growth, while assuming that distribution and quality would take care of themselves. In the largely rural United States of pre-World War I, this represented a fair coincidence with a broad general public good.

What has happened in the twentieth century is that the Land Grant establishment has redefined its mission to be primarily production agricultural efficiency rather than the much broader charge contained in the Hatch Act. Thus, rather than perceiving the general public, particularly those that are "disadvantaged," as our clientele we have given special attention to production agriculture. But even more restrictive, we have tended to identify with successful production agriculture.

Judged against this more restrictive goal and clientele group, the efforts were very successful. Productivity in agriculture was increased significantly, labor was displaced, and food was plentiful. While doing this we have identified very closely with our perceived clientele so that often, after a couple of generations, we begin to think like them, share their values, and come to perceive their sanction of our activities as necessary and desirable.

If the above scenario has some validity, we have tended to become less servants of the general public and more servants of a restricted agricultural clientele. This is the sum and substance of the issue and it is my contention that this has unfortunately happened to some extent, thus explaining my agreement with parts of *Hard Tomatoes, Hard Times*. If we now interpose on this restricted view of our obligations urban legislatures and financial pressures which result in our depending increasingly on the "agribusiness complex" for support, our claims to objectivity in the public interest become severely tested.

The issue of who pays and who benefits is also becoming increasingly acute. This is so for several reasons. First, as agriculture and agribusiness become more concentrated, the purely competitive assumption that cost reducing (efficiency) research is ultimately passed on to the consumer in the form of lower costs becomes more tenuous. Coupling this with the increased role of government, either directly through commodity programs or indirectly through marketing orders, as a controller of supply, makes it no longer necessarily true that all or even any of the benefits of cost reducing research are passed on to the ultimate consumer. Second, if the above has validity, then some of the direct and indirect beneficiaries of publicly subsidized research and education are fewer and larger profit-making private firms. If we accept the concept that private benefits are private costs, and if research directions continue as they are, then industry should pay more of the costs and the public less. This conclusion, however, raises more acutely the question of objectivity and wide public benefits if, in fact, he who pays the piper calls the tune. Third, increasing numbers of the public are not unequivocally convinced that our research is all to their benefit. Issues of environmental quality, consumer safety, nutrition, quality of rural life, and many others have arisen in part, in the public's mind, because of our single purposed dedication to production efficiency. They therefore question whether the public benefits.

Some will contend that I have drawn the picture too bleakly, but I submit that these issues are real and needing of attention. The Land Grant research and education complex has an enviable record of applied research and extension. We have demonstrated our capability to solve problems. Some even argue we have been too successful, thus working ourselves out of a job. I disagree. Our historic charge is broad and leaves many unsolved issues. Either we accept those challenges and reorder our priorities or we could become a contract research outfit for agricultural industry. It is time we refocused our goals to serve our many publics, including, but not limited to, agribusiness. When those goals are established, we should seek support, monetary and otherwise, from all those who agree with those goals.

My conclusion is that the question posed in the title cannot be unequivocally answered either way This as you may have detected causes me concern. We need to examine carefully, in the full view of the general public, our goals and processes so that the question is irrelevant in the future.

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Summary of the Discussion: DALE E. HATHAWAY, Ford Foundation

There was general agreement between the panel and audience that the allocation of research monies has been strongly biased against working on the problems of people, especially the low income farmer and farm worker. There also was agreement that the proportion allocated to the social sciences was too low in total—not a surprising conclusion from a group of social scientists.

There was substantial discussion and recognition that in the United States the obtaining of public research funds is a political process. Several argued that, as a result, the public research system had to bias its research toward the commercial farms and agribusiness groups because these groups have been the source of political support for public funds for agricultural research. At this point the discussion turned to whether we have really actively sought support for other kinds of research or if, in fact, we have been content to get our money the easy and traditional way.

Several persons made the point that it is our responsibility individually as social scientists and as a profession to develop and vigorously put forth more balanced research programs. Dr. Mehren argued that a major problem was that agricultural economists were not capable of formulating research projects of relevance and with precise methodology to deal with human problems. Several members of the audience disagreed with him.

There was no discussion of one of the major issues—that of the biased impact of technical science research in agriculture and its causes and cure Even though there was a former and a present research administrator who have or had responsibility for total balance in agricultural research, neither dealt with the question beyond saying that the political process favored the bias toward production efficiency as a goal. There was a limited discussion of why social science research had done so little to point out the costs and benefits of this concentration on production efficiency.

The meeting ended on the note that much of the responsibility for the determination of research priorities and, thus, much of the blame for our dismal record in the area of research on the problems of the disadvantaged rests on the individual researcher and the profession. Thus, we began discussing a guilt complex arising from being part of a conscious conspiracy and ended with a guilt complex that the internal value systems of agricultural economic researchers were the major problem.

While this conclusion does not solve the problem of research priorities, it did appear useful to air these issues and, as a result, to admit we are more free agents than we generally recognize in determining research priorities. Thus, we are more a captive of ourselves and our training than of the agribusiness complex.

Sectional Meeting J

WATER RESOURCE DEVELOPMENT AND THE NORTH AMERICAN CONTINENT

CHAIRMAN: E. ROY TINNEY, World Bank, Mexico

Evolving Water Policies in the United States

GARY D. COBB

THE PURPOSE of this paper is to describe a number of the emerging water policies in the United States. The paper is divided into three main parts discussing the topics of the New Federalism, planning policies, and Principles and Standards.

First, a brief description of the Water Resources Council and its function is in order. The Water Resources Council was established by the Water Resources Planning Act of 1965 (Public Law 89–80). Its membership includes the Secretaries of Agriculture; Army; Health, Education and Welfare; Interior; and Transportation; and the Chairman of the Federal Power Commission. The Secretaries of Commerce and Housing and Urban Development and the Administrator of the Environmental Protection Agency are associate members. Observers include the Chairman of the Council on Environmental Quality, Director of the Office of Management and Budget, the Attorney General, and the Chairmen of the six existing river basin commissions. The Secretary of the Interior is Chairman of the Council.

As set forth by the Water Resources Planning Act, the Council is to prepare a national assessment, recommend water policies, establish planning standards, coordinate comprehensive planning, recommend river basin commissions, review river basin plans, assist state planning, and take other actions to carry out the Water Resources Planning Act and Executive Office assignments.

The New Federalism

During the second session of the 92nd Congress, several important new pieces of legislation concerning natural resources were enacted into law. These include: the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92–500, October 18, 1972), the Coastal Zone Management Act of 1972 (Public Law 92–583, October 27, 1972), and the Rural Development Act of 1972 (Public Law 92–419, August 30, 1972). In addition, during that session and again during the first session of the 93rd Congress, the Congress has been actively considering land use legislation. This new and emerging legislation all places greater responsibilities for planning and management of natural resources at the state level. In support of this policy, these programs variously call for the establishment of planning processes, the preparation of comprehensive plans, and the authorization of substantial funds to implement such programs.

In these programs the federal role is directed toward the provision of financial and technical assistance to the states, coordination of basic research, and establishment of interstate or national standards. These roles of the federal government and the states, placing greater responsibility for decision making at the state level for natural resources management, are consistent with the President's "New Federalism" by providing that the responsibility for public matters is shifted down the intergovernmental ladder to the lowest level of government that is capable of adequately and effectively handling the problem. The "New Federalism" is outlined in the fiscal year 1974 budget message as follows:

> . . . the power to make many major decisions and to help meet local needs will be returned to where it belongs—to State and local officials, men and women accountable to an alert citizenry and responsible to local conditions and opinions.

It appears that new and emerging natural resources legislation is moving more and more in that direction.

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Planning Policies

In mid-1970 the Water Resources Council approved a policy statement, "Water and Related Land Resources Planning," defining levels of planning which range from broad assessments to detailed implementation studies.

Levels of planning

At the broadest level of planning as defined by the Council, framework studies and assessments are the evaluation or appraisal on a broad basis of the needs and desires of people for the conservation, development, and utilization of water and land resources, and will identify regions or basins with complex problems which require more detailed investigations and analyses, and may recommend specific implementation plans and programs in areas not requiring further study. Such studies will consider federal, state, and local means and will consider both national economic development and environmental quality objectives.

Regional or river basin plans are reconnaissance-level evaluation of water and land resources for a selected area. They are prepared to resolve complex long range problems identified by framework studies, and assessments will vary widely in scope and detail; will involve federal, state, and local interests in plan formulation; and will identify and recommend action plans and programs to be pursued by individual federal, state, and local entities. Such plans will consider both national economic development and environmental quality objectives also.

At the most detailed level of planning as defined by the Council, implementation studies are programs or project feasibility studies generally undertaken by a single federal, state, or local entity for the purpose of authorization or development of plan implementation. These studies are conducted to implement findings, conclusions, and recommendations of framework studies and assessments and regional or river basin studies which are found to be needed in the next 10 to 15 years. As with framework studies and regional or river basin plans, they will consider both national economic development and environmental quality objectives.

Two other policy statements which have been recently approved by the Council should also be mentioned. They are: (1) "Environmental Statements—Framework Studies and Assessments and Regional or River Basin Plans" and (2) "Revisions of Completed Regional or River Basin Plans." The first document includes the concept that properly formulated programs which make a full and systematic evaluation and consideration of environmental effects will provide the type of information and analysis needed for environmental statements. In the final policy statement the Council provides a mechanism for revision of completed plans in order to reflect changes in goals to be served.

Cost sharing

Another major policy area where there is emerging increased interest is concerned with the appropriate sharing of costs by the federal government and nonfederal interests and entities for implementation and operation of various natural resources programs. In testimony before the Subcommittee on Water and Power Resources, Senate Committee on Interior and Insular Affairs on July 17, 1973, Chairman Morton noted that the National Water Commission had concluded that present cost-sharing policies are grossly inconsistent and lead to inefficiencies and inequities at both the federal and nonfederal levels. In addition, the Chairman noted that the National Water Commission held the views that competition for water and water related services in the future will require that the beneficiaries pay for economic benefits commensurate with benefits received and that willingness to pay should be a major determinate in implementation of proposed improvements.

The Chairman indicated that Water Resources Council's views on cost-sharing are similar to those of the National Water Commission. The Council believes, however, that the major changes in cost-sharing require an awareness of the differing federal programs and policies. The effect of significant changes should be carefully considered in application. The Chairman then further indicated that the Administration intends to develop legislative proposals with respect to the Commission's recommendations on cost-sharing within the next several months and the Chairman had therefore recently directed that a special interagency task force be formed to initiate a review of alternative cost-sharing arrangements. This review would be directed toward recommended new cost-sharing policies.

The President in a letter to the Chairman dated August 3, 1973, primarily concerned with the Council's new Principles and Standards, noted his understanding that analysis of ways to assume more equitable cost-sharing by the beneficiaries of water resources projects is underway. The President asked that the Chairman complete this work promptly so that draft legislation can be transmitted to the Congress in time for enactment this year. Accordingly, the Council has initiated an intensive review of existing cost-sharing policies.

Principles and Standards

In the Flood Control Act of 1936, the Congress stated a policy relating to flood control which over the years has been broadened to other purposes. This policy was

> . . . that the Federal Government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, for flood control purposes if the benefits to whomsoever they accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected.[1]

Over the years since the passage of that Act, Congress through various enactments has broadened the objectives to be served in water and land resources planning. Many analytical procedures have been developed to evaluate benefits and costs. These efforts have recognized that all benefits and all costs must be considered, but the tendency has been to rely primarily on market or monetary considerations with much less consideration being given to nonmonetary and intangible values.

The Water Resources Council began a review of Principles and Standards for water and related land resources planning in December 1968 in response to changing public priorities and preferences and to comply with the Water Resources Planning Act of 1965. This Act directed the Council to establish, with the approval of the President, principles and standards to guide federal participation in planning the use of the nation's water and related land resources and for planning and evaluating water and related land resources programs, projects, and activities.

A rising tide of public concern about the environment and the quality of life had been reflected in a series of Congressional enactments and Executive policies that gave new direction to planning for water and land resources. In 1969, after a preliminary report of a Special Task Force had been prepared, the Council held public hearings in Washington, D. C., and in various other locations across the country to solicit views, recommendations, and comments on the preliminary report. In addition, the preliminary report was distributed widely for review and comment at various meetings and seminars and the proposal contained in the report was subjected to extensive analytical field testing during this period. The Special Task Force submitted its final recommendations to the Council for consideration in August 1970.

The Council reviewed the findings and recommendations of the Special Task Force and published its proposed "Principles and Standards for Planning Water and Related Land Resources," along with a separate "Draft Environmental Statement" on the proposed Principles and Standards in the "Federal Register" on December 21, 1971. At the same time, notice was given in the Federal Register by the Council of a period of public review and comment commencing on the date of publication and terminating March 31, 1972. As a part of the review a public hearing was scheduled to be held in Washington, D. C., on March 20 and 21, 1972. Subsequently, in response to reaction to this notice, the Council scheduled two additional public hearings as part of the announced period of public review and comment. A 320-page Summary-Analysis of the public response to the proposed Principles and Standards was published by the Water Resources Council at the close of the review period. The official public record was 8,500 pages in length and included 4,782 statements. Included in the publication is an index of all individuals, organizations, and elected officials who contributed comments during the 100-day review and during the seven days of public hearings.

The Council considered the views and comments received during the hearing and period of public comments over a period of about one year, and on July 24, 1973, made recommendations to the President for his approval regarding new Principles and Standards. The President approved the Principles and Standards as recommended by the Council, August 3, 1973.

The Principles provide the framework for planning and the Standards provide for uniformity and consistency in planning. The Principles and Standards are to apply to federal participation in comprehensive framework studies and assessments and regional or river basin planning of water and land resources and to certain federal and federally assisted programs and projects. In addition, the Office of Management and Budget, the Council on Environmental Quality, and other organizations in the Executive Office of the President will use the Principles and

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[1] U. S. Code Title 33, Section 701a.

Standards in their review of proposed projects and basin or regional plans.

Under the Principles and Standards, plans for the use of the nation's water and land resources will be directed to improvement in the quality of life through contributions to the objectives of national economic development and environmental quality. The beneficial and adverse effects on each of these objectives will be displayed in separate accounts with other accounts for the beneficial and adverse effects on regional development and social well-being. Each of the two broad objectives is to be given equal consideration in the conservation, development, and use of water and land resources. Neither of the two objectives would be considered to have at all times priority over the other objective. Rather, society's priorities and preferences for attainment of the two objectives would be determined as a part of the planning process.

Objectives

The following objectives have been defined by the Council:

1. *NED Objective*—To enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency.
2. *EQ Objective*—To enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

Beneficial and adverse effects are measured in monetary or nonmonetary terms. Estimating these beneficial and adverse effects is undertaken in order to measure and display in appropriate accounts the net changes, with respect to the two objectives, that are generated by alternative plans. In addition, for each alternative plan the beneficial and adverse effects on regional development and social well-being will be displayed where appropriate. Beneficial and adverse effects are measured in qualitative units or qualitative terms appropriate to a particular effect. The accounts are not mutually exclusive with respect to beneficial or adverse effects, and final decisions as to the selection of the recommended plan will be made by considering the differences among alternative plans as to all their effects.

Accounts

A system of public information accounts will be established to display beneficial and adverse effects of alternative plans. For purposes of accounting, the distribution of beneficial and adverse effects will be shown to whomsoever they accrue. This will include display of the distribution of effects to regions, income classes, and interest groups relevant to the particular alternative plan.

To facilitate comparison among alternative plans, a discount rate is established to compare both beneficial and adverse effects toward objectives accuring in the future with those occurring in the present. The discount rate will be established in accordance with the concept that the government's investment decisions are related to the cost of federal borrowing. The rate for the remainder of fiscal year 1974 will be established at 6 and $\frac{7}{8}$ percent and will change up or down as appropriate, not more than or less than $\frac{1}{2}$ of 1 percent per year.

Retroactive application

The Principles and Standards will be applied to all authorized but unfunded projects on a selective basis to be determined by the head of the agency with opportunity for suggestion from the Water Resources Council and other governmental entities.

Comparison with preceding standards

The new Principles and Standards approved by the President represent a major step in the evolution of planning policies. Under previous procedures, plans were intended to be formulated under rather rigorous economic standards to achieve maximum net economic benefits. Adjustment could be made in the most efficient plan to take account of other considerations such as the environment. This approach has not worked well because almost exclusive weight has been given to monetary values. In addition, not enough information has been reported on alternative plans, and decision makers have, therefore, not had information available to them on which to base alternative decisions. Under the previous standards and procedures, the discount rate was based upon the average yield on interest-bearing marketable securities of the United States, which at the time the computation is made have terms of 15 years or more remaining to maturity. The rate established for fiscal year 1974 based on this formula is 5 and $\frac{5}{8}$ percent.

Conclusions

There has been a major thrust in the evolution of water policies in the United States to consider environmental quality. This has been reflected in a number of Congressional Acts and Executive actions including the enactment of the National Environmental Policy Act of 1969 (Public Law 91–190). As provided by the new Principles and Standards, the explicit consideration of the environmental quality objective in formulating plans for the use of the nation's water and land resources provides opportunity for consideration of significant enhancement of the quality of the environment. Rather than simply displaying environmental impacts, the planning process established in the Principles and Standards requires explicit consideration of the environmental quality objective, providing that at least one plan be formulated which emphasizes contribution to that objective. In addition, the planning process established in the Principles and Standards requires that plans be directed to meeting current and projected needs and problems as identified by the desires of people in such a manner that improved contributions are made to society's preferences for national economic development and environmental quality.

Other alternative plans will be formulated to achieve varying levels of contributions to the national economic development and environmental quality objectives. Thus, the trade-offs between the two objectives are made explicit, allowing for the priorities and preferences of the affected public to be more fully considered by decision makers in the decision making process. The Council's new Principles and Standards should further the purposes of the National Environmental Policy Act of 1969, while at the same time providing for resolution of conflict.

Mexican National Water Plan: Organization and Preliminary Assessment

FERNANDO J. GONZALEZ VILLARREAL

MEXICO's industrial development and rapid population growth have led and will continue to lead in the future to an increasing total and per capita demand for water, diminishing the quantity of available resources to meet future needs. In addition to the problems derived from the amount of available water resources, the pollution of the rivers, oceans, and other bodies of water makes the utilization of this resource increasingly difficult and constitutes a serious threat to the future welfare of the population.

Although the average annual rainfall in the country is 780 millimeters per year, its distribution is very irregular since it is concentrated within a rainy season of a few months and much of it falls in areas that are only lightly populated. The location of population and economic development centers is inversely related to the availability of water, since the southeastern area, which accounts for only 7 percent of the total land area of the country, has 40 percent of the water resources and 8 percent of the population, while the central highlands and northern mesa have 60 percent of the population, comprise 50 percent of the national territory, and have only 12 percent of the resources just mentioned.

Mexico has been overcoming obstacles to development, and the creation of an agricultural infrastructure has made it possible to maintain a high rate of economic growth. The revolutionary movement of 1910 began the agrarian reform and revindicated the nation's property rights over land and water. Multiple-use hydraulic works have been constructed throughout the country and have made it possible to satisfy vital needs for food and services. However, this development process has not brought an even distribution of progress among all the country's inhabitants, all its regions, or all sectors of the economy. In fact, there has been a noticeable and persistent tendency to unjust distribution of the benefits of economic growth. Furthermore, the necessity of importing capital goods for development needs has led to deficits in the balance of payments and a growing foreign debt.

In order to achieve a balanced development of the economy, the present administration has established the following objectives:

1. improved distribution of the national income;
2. reduction of our dependence on foreign centers;
3. achievement of the highest possible development rate compatible with economic and social stability; and
4. preservation of the good quality of the environment.

The scarcity and unequal seasonal and regional distribution of water are obstacles to the utilization of such resources and require growing investments to meet demands. At the same time, the time that must elapse between the conception of new hydraulic works projects and the moment when they begin operations is becoming increasingly longer. As Mexico's available water resources grow scarcer and more difficult to exploit, efforts to achieve greater efficiency in utilizing these resources and in setting priorities become more important.

Water resources planning is particularly complex due to the fact that water is used by practically every sector of the economy, whose development must be considered as a whole. It would be a mistake to try to isolate problems by regions without considering a national frame of reference. Mexico's investments in water resources development will of necessity be increased in the future, and their impact on the environment, the economy, and the social situation of the country will be of great importance in the coming decades.

To give added agility to the planning process, the Ministry of Water Resources undertook the task of drawing up the National Water Plan, based on the information provided by studies and accumulated experience in the country. The National Water Plan is oriented to fulfill the following objectives:

1 Formulation and establishment of a systematic process of planning utilization of water resources for the rational selection of programs, projects, and policies under this

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heading that will best contribute to achieving the objects of national socioeconomic development.
2. Formulation of policies related to water use and control, with recommendations for pertinent institutional measures.
3. Formulation of alternative programs for short, medium, and long term development of water resources, including a preliminary identification of projects.
4. Design of an information system that will cover immediate needs and assure a flow of data for systematic planning.
5. Establishment of a systematic program of basic and advanced training that will meet complementary personnel requirements in every area and activity included in the plans, programs, and projects for utilization of water resources.

In order to provide for international advisory services in some important aspects of the Plan as well as to make Mexico's own experience and that acquired during future work available to other countries, it was considered pertinent to reach an agreement with the United Nations Development Program. The executive agency for the technical assistence provided by UNDP is the World Bank; the authority provides a solid framework for future credit programs.

Organization

The National Water Plan organization is structured to assure adequate communication channels among the different national and international departments and organizations participating in the program. The Board of Directors, whose members include the Director of the National Finance Institution (Nacional Financiera) and the Secretaries of the Presidency and of Finance and Public Credit, and which is headed by the Secretary of Water Resources, is the highest authority, in charge of issuing general directives on research and executing policy decisions. The Consultative Council, made up of three national and three foreign experts, is responsible for evaluation of reports and for making observations and recommendations which are then submitted to the consideration of the Board of Directors. The World Bank, in its role of executive agency, provides consultation on matters related to the elaboration of the project.

In order to guarantee communication and coördination between work performed by the Plan and that carried out by other departments, a board of Undersecretaries and General Directors from the Ministry of Water Resources and a Coordination Committee composed of personnel from other government departments were formed. UNDP's contribution comprises pay of experts, equipment, seminars, and scholarships. The government, in turn, contributes everything necessary for setting up the working groups and carrying out Plan studies.

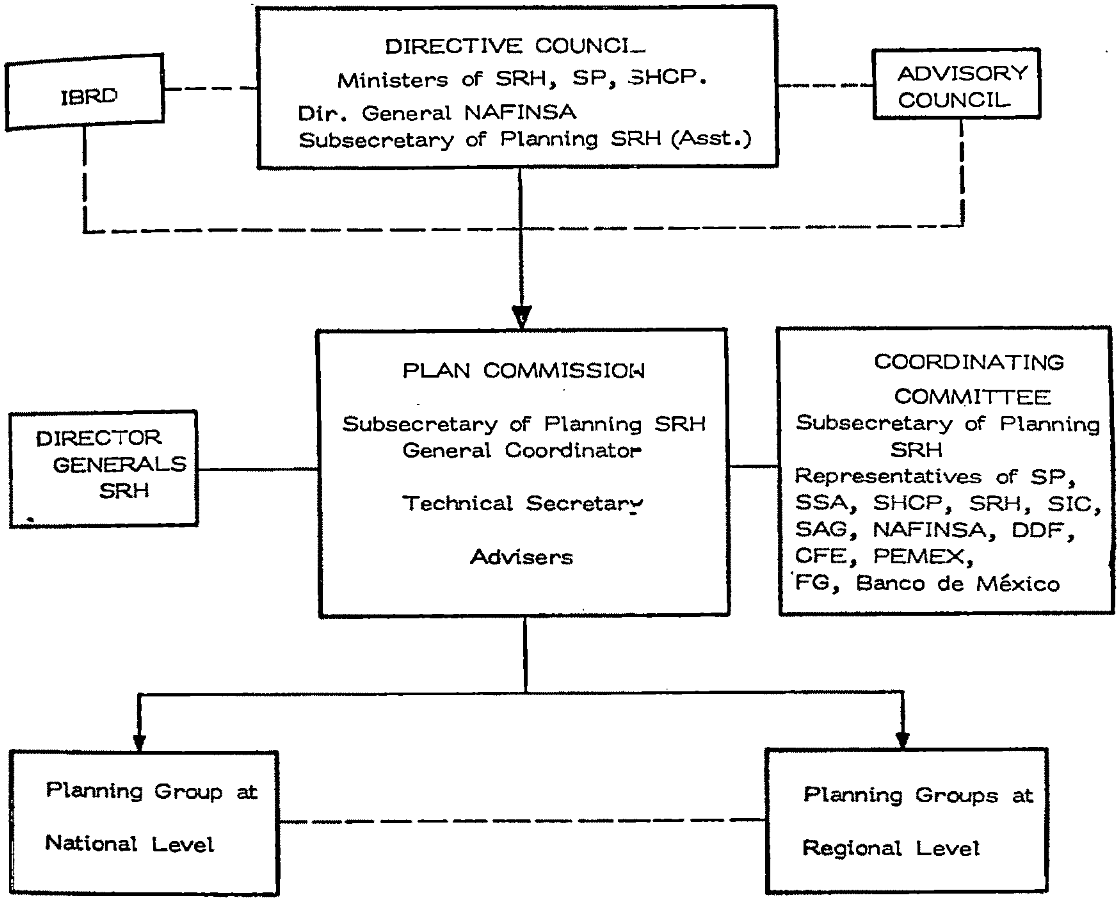
At the executive level, the Plan Commission, headed by the Subsecretary for planning of Secretaría de Recursos Hidráulicos was set up. It includes working groups with both Mexican and foreign members that operate under a General Coordinator. The nature of the problems involved in water resources availability and demands made it necessary to divide the working groups into those having a national and those having a regional approach, as can be seen in Figure 1.

Methodology

The method of study allows for both national and regional approaches. The national approach analyzes the aggregate of variables that describe national socioeconomic development and problems that are common to the various regions of the country. This group is divided into the five following subgroups: frame of reference, water uses and demand, land and water inventory, technology, and formulation and evaluation of policies and programs. A first regionalization showed that it is possible to divide Mexico in 13 regions as shown in Figure 2. At the regional level, a homogeneous approach is taken to study the wide range of problems resulting from the needs, constraints, and potentialities that are characteristic of each region.

Almost all the phases of the water resources planning process are currently in existence in the Ministry of Water Resources. One of the aims of the NWP is to make an explicit presentation of the process in order to orient all action in water resources matters toward fulfillment of the overall objectives of national development.

The general method for planning is illustrated in Figure 3 and is described in the next paragraphs. The National Water Plan and especially the frame of reference group will use, as a basis for determining the socioeconomic situation, the existing studies and information that have been carried out or gathered by government departments and agencies, from which the aspects of water resources that are related to the national or regional development will be derived. During


IBRD
DIRECTIVE COUNCIL
Ministers of SRH, SP, SHCP.
Dir. General NAFINSA
Subsecretary of Planning SRH (Asst.)
ADVISORY COUNCIL
DIRECTOR GENERALS SRH
PLAN COMMISSION
Subsecretary of Planning SRH
General Coordinator
Technical Secretary
Advisers
COORDINATING COMMITTEE
Subsecretary of Planning SRH
Representatives of SP, SSA, SHCP, SRH, SIC, SAG, NAFINSA, DDF, CFE, PEMEX, FG, Banco de México
Planning Group at National Level
Planning Groups at Regional Level

CFE = Comisión Federal de Electricidad (Federal Electricity Commission)
DDF = Departamento del Distrito Federal (Federal District Department)
FG = Fondo de Garantía (Guarantee Fund)
NAFINSA = Nacional Financiera, S. A.
SAG = Secretaría de Agricultura y Ganadería (Ministry of Agriculture and Stockraising)
SHCP = Secretaría de Hacienda y Crédito Público (Ministry of Finance and Public Credit)
SIC = Secretaría de Industria y Comercio (Ministry of Industry and Commerce)
SP = Secretaría de la Presidencia (Secretariat of the President's Office)
SRH = Secretaría de Recursos Hidráulicos (Ministry of Water Resources)
SSA = Secretaría de Salubridad y Asistencia (Ministry of Health and Public Assistance)

Figure 1. Organization of SRH, UNDP, and IBRD for the National Water Planning Study

this stage, special importance must be given to a diagnosis of the social and economic situation that will be made on both a national and a regional scale and will take into account the dynamic nature of the development that has occurred in recent decades. The diagnosis will be the basis for projections to be made in accordance with the tendencies noted in order to obtain an up-to-date picture of the future, and, in general, different scenarios that may be expected to result from different development policies and goals. In this way, objectives, goals, and policies for each region and for the country as a whole are established and a forecast of the relevant variables in planning water resources development is made.

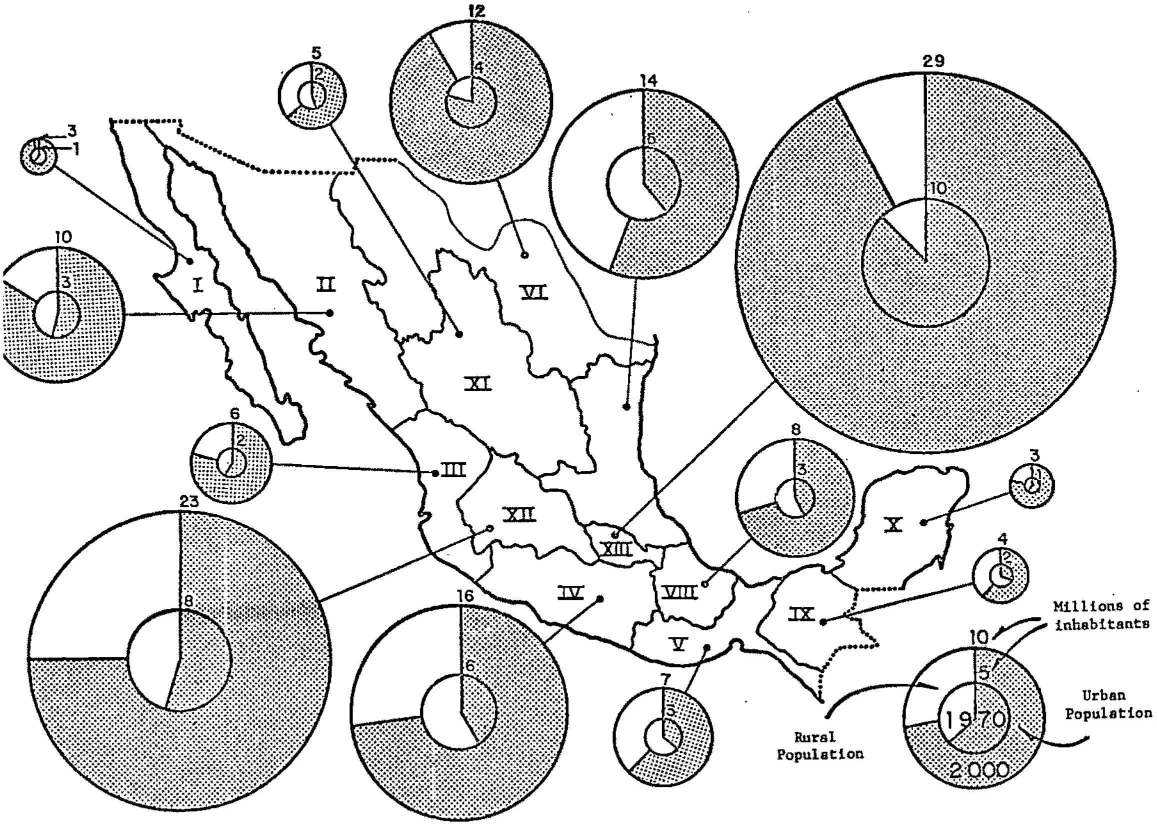


Figure 2. Distribution of rural and urban population by regions in years 1970 and 2000

The study of the availability and use of water resources is one of the activities carried out by the Ministry of Water Resources. In this respect, the objectives of the National Water Plan lies fundamentally in establishing the manner in which these problems are linked to the socioeconomic panorama and to alternative development plans that facilitate a clear analysis of possibilities and plans for utilization of water resources that can lead to the achievement of national objectives or to the solution of regional problems. The formulation and integration of regional programs has for some years been one of the activities of the Ministry of Water Resources. The National Water Plan will culminate this task by working out regional integration programs that cover every sector of activity and fall within the frame of reference of national development. The study will place special emphasis on determining the recommendations for new project studies, with a view to their eventual inclusion in a catalogue that will make it possible, in the future, to select the most promising alternatives and fix investment priorities.

One of the most important stages in the analysis is that of National Integration of Programs, which calls for the complete evaluation from a national viewpoint of all regional programs. The evaluations will be made with reference to established goals, policies, and objectives, and will provide estimates of the amount and allocation of resources necessary to carry out the programs.

By making a balance of quantity and quality of needs and availability of resources, it is possible to adjust goals or to modify policies, steps that will provide a feedback to the socioeconomic panorama, thus completing an iteration of the planning process. Furthermore, this panorama will be enriched and improved by the results of the projects in operation. This briefly described plan of operations has served to orient the elaboration of a detailed work program that is already in execution. The Plan working group will carry out two iterations of the process described, the first of which will be completed by the end of the year, the latter by mid-1975.

Economic Activity

The 6.5 percent growth rate of Mexico's gross national product is fairly high in comparison

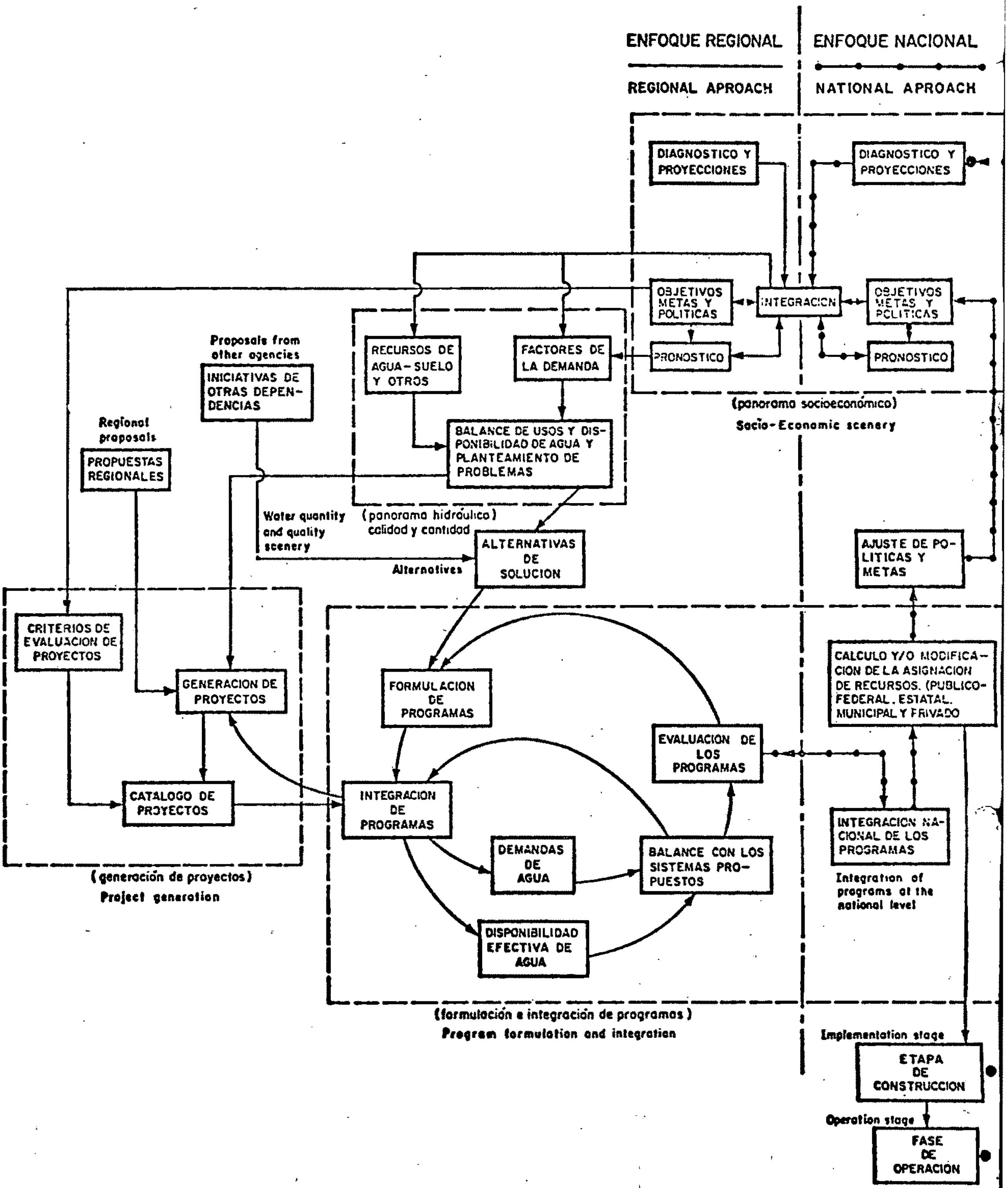

ENFOQUE REGIONAL
REGIONAL APROACH
ENFOQUE NACIONAL
NATIONAL APROACH
DIAGNOSTICO Y PROYECCIONES
DIAGNOSTICO Y PROYECCIONES
OBJETIVOS METAS Y POLITICAS
INTEGRACION
OBJETIVOS METAS Y POLITICAS
PRONOSTICO
PRONOSTICO
(panorama socioeconómico)
Socio-Economic scenery
Proposals from other agencies
INICIATIVAS DE OTRAS DEPENDENCIAS
RECURSOS DE AGUA-SUELO Y OTROS
FACTORES DE LA DEMANDA
BALANCE DE USOS Y DISPONIBILIDAD DE AGUA Y PLANTEAMIENTO DE PROBLEMAS
Regional proposals
PROPUESTAS REGIONALES
Water quantity and quality scenery
(panorama hidráulico) calidad y cantidad
ALTERNATIVAS DE SOLUCION
Alternatives
AJUSTE DE POLITICAS Y METAS
CRITERIOS DE EVALUACION DE PROYECTOS
GENERACION DE PROYECTOS
CATALOGO DE PROYECTOS
(generación de proyectos)
Project generation
FORMULACION DE PROGRAMAS
INTEGRACION DE PROGRAMAS
EVALUACION DE LOS PROGRAMAS
DEMANDAS DE AGUA
BALANCE CON LOS SISTEMAS PROPUESTOS
DISPONIBILIDAD EFECTIVA DE AGUA
(formulación e integración de programas)
Program formulation and integration
CALCULO Y/O MODIFICACION DE LA ASIGNACION DE RECURSOS. (PUBLICO-FEDERAL. ESTATAL. MUNICIPAL Y PRIVADO
INTEGRACION NACIONAL DE LOS PROGRAMAS
Integration of programs at the national level
Implementation stage
ETAPA DE CONSTRUCCION
Operation stage
FASE DE OPERACION

Figure 3. General method for the study of the National Water Plan of Mexico

with that of other countries. Nevertheless, the present administration considers that from the social point of view the growth rate has not been particularly satisfactory. The President of Mexico has declared that "For the federal executive branch, the govern shall be to make an equitable distribution of the fruits of the efforts and to see that the more fortunate regions and groups contribute to the development of those which have been left behind." A national water plan must contribute to increase exports and to reduce the inflationary pressures that have become so evident throughout the world. It is within this new shared development strategy that the National Water Plan is operating.

Mexico's annual population growth rate of 3.5 percent and its urban growth rate of over 5 percent are among the highest in the world (Figure 2). This implies an accelerated increase in demands for goods and services that constitutes a serious problem, particularly when we recall that the costs involved to satisfy those demands are continuously growing. The sectorial income imbalance is reflected by the fact that the product generated by each active worker in the agricultural and livestock sector is four times less than the average per capita product of the economy. A new strategy with social content that is directed more to make a fair redistribution of income than to achieve high growth rates has been adopted.

Balanced growth requires an export growth rate of about 12 percent and an agricultural and livestock sector growth rate of about 5 percent. The demand for resources resulting from this growth must therefore be met. Industrial development at an annual rate of more than 8 percent brings with it a growing need for the materials and services employed in production, including such natural resources as water. On the other hand, the geographic concentration of industrial activity relates to water consumption and pollution.

Water Demand

Development generates demands for resources, among them water. Naturally, both the water utilization plans that are proposed to satisfy regional needs and the institutional and administrative framework within which these plans operate influence water demand. NWP studies of water use are intended to analyze present utilization of this resource in various activities and to provide the tools that will make it possible to estimate water demands that will arise from specific water utilization schemes in a given area, taking into account all the factors that influence demand, such as climate, water rates, pollution standards, and technological change.

From present Mexican data and foreign indexes, it has been estimated that of the 390 billion m^3 of annual runoff, the total withdrawal in 1970 was 110 billion m^3, of which 30.4 billion were consumed. While 68 percent of the withdrawal corresponded to electric power generation, agriculture accounted for 95 percent of the consumption. These percentages will probably continue to apply in 1980, even if total withdrawal rises to 210 billion and consumption to 60.4 billion m^3. Both in withdrawal and in consumption the water needs of industry and the population are less than 5 percent for 1970 and 1980. Although at the national level there seem to be shortage problems, there are some regions where demand exceeds the annual runoff and recharge and the pollution indexes are growing very fast. This means that transfers are to be made among regions, and pollution control must be enforced. This situation can be seen in Figures 4 and 5.

During the decade of the seventies, some two million hectares should be irrigated. This, together with the 4.5 million already in existence, would make our irrigated land reach the figure of around 6.5 million hectares. Simultaneously, the potable water demand of cities, particularly Mexico City, must be met. It is possible that in the future, fish hatcheries and nurseries will require important quantities of water and that both this activity and tourism will impose restrictions on the quality of water used. River navigation has never been very important in Mexico, but it might develop in the northeastern and southeastern regions of the country.

A basic idea of regional water problems may be gained by making a rough balance between uses and availabilities. Three of the regions of the country have already either exhausted the available resources of run-off or will have done so by 1980.

The vertical bars in Figure 5 represent concentrations of biochemical demand for oxygen as well as concentrations of solids produced by the wastes from urban-industrial activity. The two upper lines in each column show the increase in wastes to be expected if potable water and sewerage is provided to 100 percent of the urban population by 1980. At present, 65 percent of this population receives these services. Naturally,

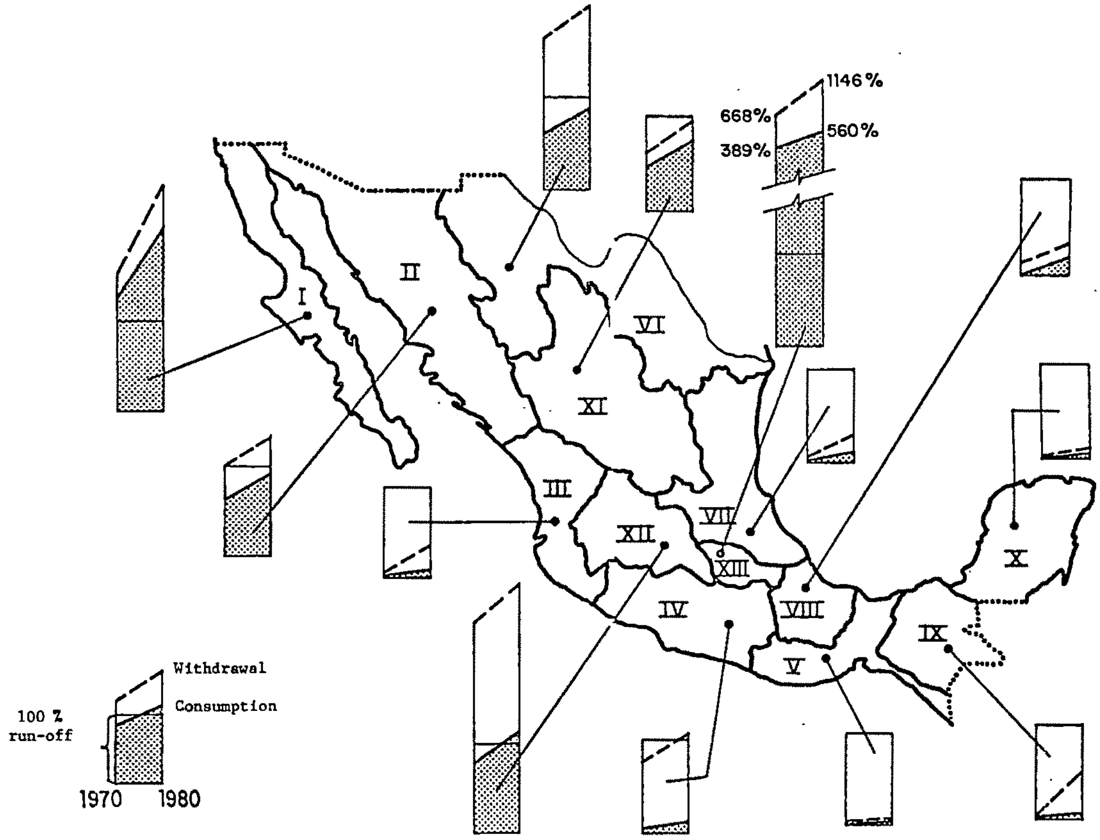


Figure 4. Withdrawal and consumption of water at the regional level

although these withdrawal, consumption, and pollution indices provide a general idea of some regional problems, they are not sufficient to carry out local studies of the demands within each region. One of the activities of the National Water Plan consists in studying the factors affecting demand and in designing tools that will allow us to estimate the water demand for different uses.

Water Resources

Surface water, groundwater, and precipitation are the resources available to satisfy the beforementioned needs. The average annual precipitation of 780 mm. is equivalent to 1.5 billion cubic meters per year. This precipitation shows a marked imbalance and varies from less than 150 mm. in the Baja California Peninsula to over 4,000 mm. in the upper part of the Grijalva and Usumacinta river basins. The greater part of the territory is arid or semi-arid with the exception of the southern Gulf and Pacific coasts and the Grijalva-Usumacinta region. Nearly 75 percent of the rainfall is consumed by evaporation and the remaining 25 percent produces an annual average runoff of 390 billion cubic meters. At present, the total storage capacity is 120 billion cubic meters, representing 30 percent of the mean annual runoff. It might be mentioned that 55 percent of this capacity is contained in a small number of reservoirs on the Grijalva, the Balsas, and the Bravo basins.

The reservoirs in arid and semi-arid zones are used mainly for irrigation, whereas in the humid zones the dams are used for power generation and flood control. Mexico is a mountainous country, and only 30 percent of the territory has slopes of less than 25 percent. It is estimated that only some 35 million hectares have an agricultural potential, and of these, only 11 million can be irrigated. At this time, 4.4 million hectares are under irrigated cultivation and 10.4 million are dependent on rainfall.

Water Policy in the Past

In 1926 the government began a policy of agricultural development based mainly on the irrigation of farmlands. The Federal Public In-

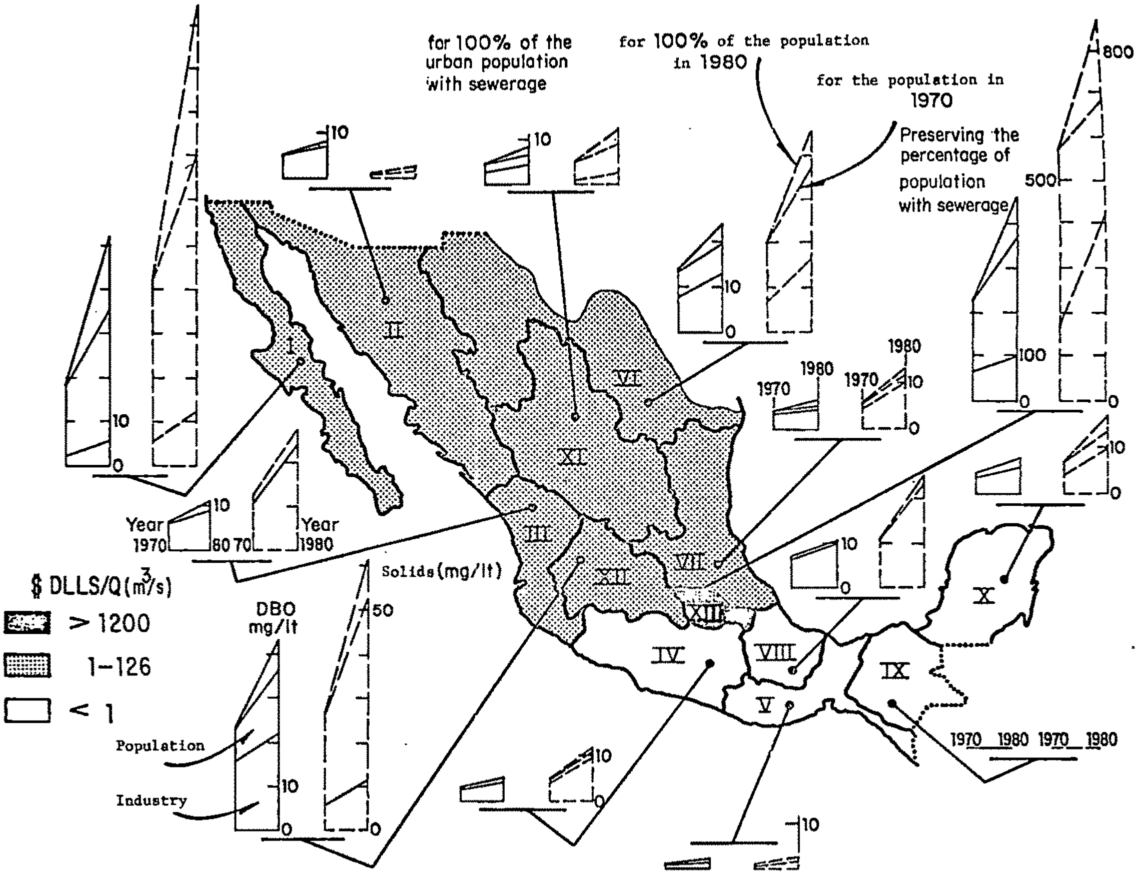

for 100% of the urban population with sewerage
for 100% of the population in 1980
for the population in 1970
Preserving the percentage of population with sewerage
800
500
100
10
0
Year 1970
80 70
Year 1980
$ DLLS/Q(m³/s)
> 1200
1-126
< 1
DBO mg/lt
Solids(mg/lt)
50
Population
Industry
1970
1980
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII

Figure 5. Regional indexes of surface water pollution

vestment directed to the development of irrigation in the country was more than 10 percent from 1926 through 1970. In the Ministry of Water Resources, the investment in small irrigation works is constantly increasing in importance, in order to increase agricultural production and to contribute to the economic development of certain low income regions. These investments produced an increase in agricultural production from 3.68 billion pesos (1970 prices) in 1950 to more than triple the amount in 1970 when production reached the figure of 11.4 billion pesos, representing respectively 22 and 31 percent of the total national agricultural production for the period. Also, irrigation has contributed most conspicuously to the diversification and exportation of agricultural production.

In the beginning, investments in irrigation were directed toward those regions from which the greatest return was anticipated, thereby producing a notable increase in agricultural production by means of the preparation of irrigated lands in areas considered arid or semi-arid where without irrigation it was impossible to obtain any agricultural production. These zones correspond to the sectors marked II, VI and XI, located in the north of the country and comprising three quarters of the total irrigated crop land. It is from these regions that we have obtained an important part of our products for exportation.

In general, the greater part of the investments has been directed to structural works for irrigation, ignoring to some extent the complementary aspects such as research and agricultural extensionism, as well as the marketing of the products. This has caused a decrease in the efficacy of the investments, for, in the specific case of the expost evaluation of Zone IV in the State of Michoacan, it was discovered that the benefit-cost relationship that might have been obtained by complementary investments would have been notably larger than those that have actually been perceived.

A certain effect of concentration of income has been observed among persons who, having capital and/or technical knowledge, exploited the agricultural potential, thus becoming the principal beneficiaries of the development brought about by public spending. For this reason, the Ministry of Water Resources is laying greater emphasis on complementary investment that will lead simultaneously to more effective returns on investments and a better distribution of the income generated by such investments.

In summary, results of the evaluation of the work done in irrigation allow us to conclude that, despite the benefits obtained from the increase in agricultural production, from the foreign currency provided by the cultivation of export crops, from the decrease in emigration to urban areas, the results obtained have still not been optimum since the main beneficiaries belong to a small group of persons, accentuating the unequal distribution of income. It is also true that agricultural growth has been restricted by the lack of sufficient industrialization of agricultural produce. In the past, such a policy of agricultural development might have been adequate for a country with a small rural population since it has created a relatively small number of agricultural units with high productive capacity, but this policy cannot be upheld in the future.

Future Development

Taking into account the results obtained from the first assessment just finished, it is possible to anticipate some conclusions regarding future development of water resources:

- Mexico is to change the direction of water resources development in the near future, investing in tropical areas where water and land are abundant and experience is poor. The development is to be made by making pilot studies and anticipating agricultural research.
- Future water resources investment is to diversify given:
  - a) that the urban population and the services demanded by them are growing rapidly;
  - b) that the desire to enforce rural development is based in small irrigation in order to integrate backward areas to development;
  - c) that flood control measures will demand more resources as population density and capital grow;
  - d) that pollution control will need more attention due to economic and population growth on areas where the physical variables, such as temperature and low flows, increase pollution problems; and
  - e) that improving the efficiency of existing water systems is getting first priority in order to utilize fully the existent infrastructure to produce food and increase agricultural exports.
- In new irrigation projects, it is important to increase the complementary measures that lead to the farmer's organization, technification, good use of credit, marketing of their products, and in general to make them real "agricultural executives."
- In the future almost all the projects should contemplate multiple uses. This fact will demand more studies and coordination with other agencies.
- Pilot projects and stage development are to be preferred, especially in the areas where experience is lacking regarding technical and socioeconomic aspects of the proposed development.
- Distribution of income and the creation of employment must be considered as goals for the projects concurrently with income generation.

The planning effort is to result, by mid-1975, in a first National Water Plan—and the means to actualize it—that will help to coordinate the actions of agencies and organizations to create water resources systems that will contribute to the overall national objectives of socioeconomic development.

National Water Policy: The Canadian Experience

A. T. DAVIDSON

TO THE BEST of my knowledge, a statement of national water policy has never been formally articulated for Canada. Perhaps this is all the more apparent today by contrast with policy statements recently made or in progress in other fields like foreign affairs and energy. In any event, the federal government is petitioned from time to time to take the lead in formulating something similar with regard to the national water situation.

There are at least two compelling reasons, I will argue, for the present state of affairs. The first is that Canada is still a young country in terms of development, where the water resource is abundant and the demands upon it, at least until recently, have been relatively small. This general observation is, as an excuse, becoming less realistic all the time. The second reason is more durable: our politically reinforced regionalism. Jurisdictional divisions between the two senior levels of government in Canada are in most respects more formidable than in Mexico or even in the United States. This must have been apparent to interested Americans who witnessed British Columbia's success at changing the terms of the Columbia River Treaty negotiations. The extensive federal agency structures dominant in water management in many countries have not developed in Canada. Before considering the nature of national policies and programs, therefore, it will be essential to develop an appreciation of the sovereign status of the ten Canadian provinces in respect to their water resources.

Given this setting and the continual need for policy adjustments as new circumstances arise or unexpected results occur, I am not sure that an official statement of Canadian water policy in other than the most general of terms would be attractive at the political level. We do not need motherhood statements, of course, but we do need flexibility. Canadian experience has been reasonably successful in applying particular policies where and when appropriate to the situation and in changing these as considered necessary. It remains, admittedly, to draw from our varied policy applications an assurance of national direction which can be consciously supported by the Canadian population.

Jurisdictional Division and Political Accommodation

The legal framework for water management in Canada has been conditioned almost entirely by the British North America Act which was the instrument of our Confederation in 1867. A reading of that Act leads one to draw a distinction between the proprietary and legislative rights of governments to water, that is, between who owns the resource and who can legislate regarding its use. This distinction is unimportant only in the northern territories where the federal Parliament retains complete jurisdiction. Elsewhere, the provinces own the resources. As owners, they may authorize and license development, regulate flows, and levy fees for most uses. The federal government, on its part, can legislate exclusively with regard to navigation and fisheries, concurrently in matters of agriculture, and otherwise in regulation of interprovincial and international undertakings, including trade.

What this early legislation could not foresee, of course, were the modern needs for multiple-purpose development and the interdependencies in the economy and ecology of water use across broad areas. Nor have the courts ever been important in Canada in defining or extending jurisdictional limits or in establishing principles for water allocation. Many questions of water law have never reached the courts; indeed there has been no litigation on interprovincial waters except incidentally to disputes over other matters. Federal legislation generally tends to be permissive in response to provincial financial and technical needs.

In Canada, a comprehensive approach to water management is almost by definition a joint federal-provincial approach. To suggest that the two levels of government should proceed separately under their respective powers, or that the provincial governments should take responsibility for initiating development in some river basins and the federal government in others is to miss the point. Greater overall benefits should attend joint development which can avoid duplication on the one hand and the general

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misallocation of resources which results from working at cross-purposes on the other.

There are, then, practical as well as constitutional responsibilities to consider, especially where large-scale, multipurpose developments may be beyond the technical and financial capacity of some individual governments and where they may have significance beyond the jurisdiction of the province. Engineering, economic, and environmental factors loom so large today that it would seem almost mandatory for governments to cooperate rather than fight over grey areas of legal uncertainty. In short, the federal and provincial governments have worked out their water relations in a political setting in which jurisdictional separation has been bridged, more or less successfully, by cooperative arrangements.

To the extent that intergovernmental cooperation is effective in realizing potential opportunities and in forestalling crises, or at least in responding to them quickly, then courts and legislatures need not define so closely the limits of future action. It is this course to which we are presently committed across the waterfront. It is the heart and soul of the Canada Water Act enacted in 1970. This Act encourages consultative arrangements between the senior levels of government and agreements for joint planning and management of any waters on a regional or drainage basis where there is significant national interest. We have begun to develop management plans under the Act in several basins, with others being considered for future investigation according to federal and provincial priorities. Likewise in newer programs of environmental impact assessment and regional water quality improvement, the magnitude of public concern nationally and of the investment required in research and management has been such as to encourage intergovernmental cooperation as never before.

The Problem-Policy-Program Framework

It has been suggested that the national presentations for this panel be considered under three headings: major problems, policies formulated to address these problems, and governmental programs flowing from the policies. The progression from *problem* identification and analysis through *policy* formulation to *program* implementation is over the longer term probably not as linear as circular. That is, research into a water problem opens possibilities for policy; policy provides the broad framework for effective action; and to complete the circle, the successes and shortcomings of action programs help to redefine the problems and challenges for another round of investigation and research. Because we cannot usually wait for all the answers to be determined before acting, and, in fact, usually learn by doing it is common for all three activities to proceed at the same time with regard to the same subject. There are, however, many instances in which governments fail to close the problem-policy-program circle. Sometimes these result from studying the wrong problems or prejudging the solutions.

Let me suggest an example or two. Canadian flood control policies and programs have attempted to provide, on the one hand, emergency relief and, on the other, reservoirs, dykes, and floodways for the respective purposes of compensating and protecting people and their property. We have for too long overlooked the consequences of these programs—that communities below the dams or behind the dykes or otherwise compensated would feel so safe as to rebuild and even intensify further their use of the floodplain and thereby simply increase the damage potential of the next serious flood. The political pressure for financial assistance to those in distress was great as was the pressure for structures to reassure the community visibly. Only slowly are we learning that something must be done about regulating further floodplain occupance or at least forcing those who want to risk losses to bear more of the costs themselves. The flood control example is only one in which we have relied on a narrow range of alternatives, particularly structural alternatives. This bias, and the restrictive terms of federal participation in financing provincial projects under the Canada Water Conservation Assistance Act, led us to repeal that Act in introducing the more flexible Canada Water Act.

On the environmental impact front, we might cite any number of examples of failing to close the problem-policy-program circle. The Peace-Athabasca Delta, 400 miles north of Edmonton, is a Canadian classic which might be considered comparable to the Grand Canyon dams controversy in the United States. Before the dawn of environmental awareness, or about a dozen years ago, a strategy was advanced by British Columbia to promote regional development with low-cost power from a massive dam on the Peace River. Costs were calculated in one province without serious regard for effects downstream on other interests and jurisdictions. There was so much water and so few people below the dam, and regulation of the spring-summer flood could only be considered as good in itself. But in filling the reservoir upstream, the Delta dried out with devastating effect on its prolific wildlife and fish populations and real hardships on native peoples who depend upon them for their subsistence. One province's program created new and unforeseen problems beyond its jurisdiction which we have now after two years of federal-provincial investigation committed ourselves to repair as best we can.

What kind of corrective feedback is appropriate to the problem-policy-program circle to ensure that we avoid future Peace-Athabasca disasters? Our recent experience in the Delta and elsewhere with mammoth hydro projects is improving our understanding of how natural systems function and our predictive capability of how they respond to interference. More important still, Canadian governments have been made aware just how highly valued the northern environment is both by residents there and, more surprisingly, by the urban populations crowding our southern borders. One does not hear so often today of those few who must give way for the greater good, who must not stand in the way of progress. Progress based on cheap power rates or free waste disposal is illusory when it excludes consideration of costs to social and environmental stability.

The only way to close the circle mentioned earlier is to broaden our accounts. To some extent this process is already underway as the burden of proof is shifted to the developers whether they be pipeline companies, highway departments, or hydro commissions. Again, the answer is probably not to be found in sweeping legislation which might be of doubtful validity as in governmental guidelines developed out of ongoing research and backed by public will. The end result will be to design better for development rather than to discourage development. With currently high unemployment rates and rapid increase (in both absolute and relative terms) projected for the Canadian labor force over the next two decades, nothing else seems economically or politically realistic.

National Monitoring and Research

The nation-building potential of Canada's lakes and rivers was recognized in the earliest days of exploration and commerce when Indian canoes extended the fur trade from Montreal and Hudson Bay into the wilderness. Canals along the St. Lawrence and Lower Lakes followed, and in the dry Western territory reclamation surveys were undertaken to assist new immigrants. Since the first hydrometric investigations of 1894, the federal government has assumed the national responsibility for collecting baseline data on a consistent basis. Its networks of streamflow, lake level, sediment load, and quality stations have gradually been expanded and improved in consultation with provincial and other interested users. This information, now subject to automatic processing, has been invaluable in water project planning of all kinds as well as in administering allocations and quality standards along and across our boundary waters.

A federally organized Canada Centre for Inland Waters and a university research support program were both founded several years ago to produce practical solutions to water environment problems through interdisciplinary research. The Centre focused first on Great Lakes eutrophication and contributed substantially to the present water quality agreement with the United States. Its activities have broadened to cover all aspects of lakes, waste treatment, hydraulic problems of special concern in our cold climate, and related social science studies. University research has been encouraged by grants to several development centers across the country, each of which attempts to address significant regional or other management issues by integrative investigations.

To complement a growing body of information on the resource and its behavioral characteristics, the federal and some of the provincial governments have begun to consider means for assessing present and possible future uses of water. Thus far, however, it has not been a national priority to proceed with a broad-based assessment of Canada's water supply-demand balance and its future needs. Even if there were, it would not likely result in a singular national plan so much as in a series of policy options for the senior levels of government to consider along with other elements of regional and national planning.

Canadian Water as a National Resource

Perhaps the most basic policy statement that can be made about Canada's water resources is that they are a priceless heritage of the Canadian people. They are not a continental commodity; they are not now nor, given the unanimity of our federal and provincial governments on this matter, ever likely to be for sale.

Leaving aside some of the exaggerated claims sometimes made about the supply of Canada's fresh waters, there are similar misconceptions on the demand side. A conventional determination of future water demand (the rest to be considered "surplus") might add up projections of present uses for domestic, industrial, irrigational, electrical, and recreational purposes in terms of discrete quantities. But, these are not the sum of our use of water in Canada. The full impact of such uses on the complex equilibrium of flows, sediments, plant and animal communities, their impact on the lifestyles of human settlements which have adapted to this setting, their impact on the quality of our magnificent recreational opportunities, their impact on our national sense of what these waterways mean to us as Canadians—these have not and cannot be so neatly calculated. We are not quite so naive now about the value of water in place even when consumptive use is small, as in our northern basins. In sum, all our water is in use already; none of it "wastes to the sea unused."

Lest it appear that we are playing a dog-in-the-manger role with Canada's abundant water resources, let me make clear that we have been active both on the domestic and international fronts, taking positive steps to improve our management capabilities and to achieve Canadian goals. The focus, however, is here within our national and provincial borders.

Implementing Water Quality Priorities

If water quantity problems—floods and shortages—are occasionally or regionally severe, the quality of the water environment is a much more pervasive concern nationally. To supplement some of my earlier comments on environmental protection, I will be more specific on recent Canadian water quality policies and programs, with a bias toward the federal level.

Following Canada's unilateral enactment of protective legislation for our Arctic waters (Arctic Waters Pollution Prevention Act of 1970), we have continued to work hard for global agreement on regulations controlling offshore and oceanic pollution. Canada put forward a number of principles at the U. N. Stockholm Conference which were accepted, such as:

> states have . . . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction.

Closer to home, the latest chapter in six decades of joint boundary waters investigations with the United States was the signing into law in 1972 by the Prime Minister and President Nixon of the Great Lakes Water Quality Agreement. Under this agreement, common quality objectives were established and the International Joint Commission was empowered to monitor the programs which are being pursued to meet these objectives, as well as the response of the Lakes to these programs. In anticipation of this international agreement, a Canada-Ontario agreement was reached which includes provision for $170 million in federal loans for municipal sewage treatment facilities and a joint research program directed to improving waste treatment technology especially nutrient removal. It is our hope that the agreement reached with Ontario will become a model for cooperative regional water quality programs with other provinces.

Under the terms of the Canada Water Act, we have reduced the phosphate level nationally in detergents to five percent, effective at the beginning of this year. From our point of view, it is unfortunate that similar regulations to minimize nutrient enrichment have not yet been adopted south of the border. The effect of current regulations under the Fisheries Act to deal with contaminants such as mercury will be buttressed by a new environmental contaminants bill which has been introduced at this session of Parliament.

Our philosophy on water pollution control is to try at least a couple of different approaches. One uses the "best practicable technology" approach to industry, with effluent regulations being set under Section 33 of the federal Fisheries Act. National baseline standards are being developed in consultation with the provinces and industrial groups. Using the other approach, water quality objectives are being established under federal-provincial agreement on waters of significant national interest, otherwise by the provinces themselves. This latter is more of a "comprehensive management" approach. The first is more likely to be effective in the short run the other in the longer term.

Concluding Remarks

Canadian actions in drastically reducing the permissible phosphate levels in detergents, in establishing effluent regulations for industries, and in seeking to control the introduction of contaminants into our environment indicate the conviction with which we have taken our statements of maintaining and improving our environment. These actions would not have been taken if we thought we had inexhaustible water supplies for interregional transfer or for export. We have shown ourselves willing to cooperate with the United States on measures which will protect, maintain, or improve the quality of boundary waters and, upon undertaking commitments, to press forward with implementation of these commitments. We feel we have thereby established our credentials in terms of formal obligations and as good neighbours.

At the federal level we are attempting to put our own house in order by insisting on adequate waste treatment at federal installations and by the judicious use of federal legislative powers in achieving those controls we feel should be applied nationally. We have adopted an open and frank approach on water resources management with the provinces and participate in institutional arrangements for joint studies and for implementation of joint plans. We are assisting the provinces, again along cooperative lines, in assessing the consequences of large development projects. The results of this work are already becoming apparent. In the 1972–73 fiscal year, for example, joint federal-provincial boards and groups have submitted to governments or have had considered by governments, an interim report on James Bay Development, pre-planning reports on the Souris River Basin and the St. Lawrence River, a major supply study for the Saskatchewan-Nelson Basin, an impact investigation of the Peace-Athabasca Delta, and a comprehensive plan for the Qu'Appelle River Basin. We expect to see further results of joint investigations now existing, to initiate similar studies for other high priority areas including coastal zones, and to advance toward agreements for implementation, where warranted, and after ascertaining public acceptability.

CONTRIBUTED PAPERS

Group I.—Marketing and Price Analysis

Chairman: Forrest Walters, Colorado State University

Papers: P. C. Huszar and D. W. Seckler, Colorado State University, "The Permanently Increasing Price of Beef"

F. E. Jensen, Rutgers University; S. E. Trieb, University of Georgia; and D. B. Erickson, Kansas State University, "Frozen Meat As a Marketing Alternative"

V. James Rhodes, University of Missouri, "Competitive Retail Pricing of Meats"

C. E. Shafer, Texas A & M University, "Autoregressive Equations for Weekly Prices: Carrots, An Example"

D. O'Rourke, Washington State University, "Alternatives to the Conventional Derived Demand Model"

Group II.—Natural Resource Economics

Chairman: Herbert Stoevner, Oregon State University

Papers: D. W. Bromley and S. C. Smith, University of Wisconsin, and W. R. Butcher, Washington State University, "Policy and Research Implications of the National Water Commission's Recommendations"

C. V. Moore, ERS, USDA, and J. H. Snyder and P. Sun, University of California, Davis, "Welfare Considerations in Water Resource Allocation"

H. H. Hiskey, Southern Utah State College; J. C. Andersen, Utah State University; and D. L. Wilson, ERS, USDA, "Some Upstream-Downstream Conflicts in Water Right Transfers"

C. L. Infanger and W. R. Butcher, Washington State University, "A Proposal for the Analysis of Individual Income Redistribution and Water Resource Development"

E. Attanasi, U. S. Geological Survey, "Impact of Water Resource Investment on Regional Development: Puerto Rico, A Case Study"

Group III.—Methodology

Chairman: James Hassler, University of Nebraska

Papers: W. G. Brown, Oregon State University, and B. R. Beattie, University of Kentucky, "Improving Estimates of the Marginal Value Productivity of Irrigation Water Using Ridge Regression"

R. D. Green, Montana State University, "A Stepwise Analysis of Stepwise Regression"

C. E. Overton, ERS, USDA, and J. C. Snyder, Purdue University, "The Box-Jenkins Technique: A New Approach to Price Forecasting"

H. Talpaz, Michigan State University, "Multi-Frequency-Cobweb Model: Decomposition of the Hog Cycle"

Z. A. Hassan, Canada Department of Agriculture, and S. R. Johnson, University of Missouri, Columbia, "Consumer Demand Parameters for the U. S.: A Comparison of Linear Expenditures, Rotterdam and Double Log Estimates"

Group IV.—Economic Policy

Chairman: Gene Sullivan, Federal Reserve Bank of Atlanta

Papers: T. P. Lianos and Q. Paris, University of California, Davis, "Income Distribution in American Agriculture: A Regional Analysis"

L. D. Lambert, ERS, USDA, "The Role of Major Technologies in Shifting Agricultural Productivity"

L. G. Sleight, ERS, USDA, and J. W. Gruebele, University of Illinois, "Economic Analysis of Increased Labor Productivity and Its Compensation Under Collective Bargaining"

B. Burnham, L. Quance, and A. Howell, ERS, USDA, "1980 and Beyond: The Impact of Research and Development Expenditure on Agricultural Production Efficiency"

C. F. Framingham and W. J. Craddock, University of Manitoba, "An Analytical Approach to the Consideration of Agricultural Income, Price, Production and Farm Size Policy Alternatives"

Group V—General Agricultural Economics

Chairman: Dale Dahl, University of Minnesota

Papers: K. C. Schneeberger and H. F. Breimyer, University of Missouri, "Energy Shortage: Implications for Agriculture and Agricultural Economists"

G. A. Pavelis, ERS, USDA, "Energy, Natural Resources and Research in Agriculture: Effects on Economic Growth and Productivity for the United States"

D. W. Holland and J. C. Redman, University of Kentucky, "Institutional Affiliation of Authors of Papers for the *American Journal of Agricultural Economics*—1953–1972"

J. G. McNeely, Texas A & M University, "The Neglect of Communications Responsibility"

K. L. Casavant, Washington State University, "Research Considerations in Improving Transportation for Agriculture and Rural America"

Group VI.—Natural Resource Economics

Chairman: Paul Huszar, Colorado State University

Papers: S. I. Schwartz, D. E. Hansen, and T. C. Foin, University of California, Davis, "An Economic Analysis of the Benefits of Use-Value Assessment Under the California Land Conservation Act"

M. McMillan, University of Wisconsin, "Land-Use Control for the Preservation of Open Space on the Rural-Urban Fringe: An Alternative Policy"

R. L. Gum, University of Arizona, "Including Aesthetic Consideration in Environmental Planning"

J. E. Osborn, Texas Tech University, "Economic Effects of a Growing Industry on a Regional Economy with a Declining Natural Resource: Texas High Plains"

F. L. Leistritz and T. A. Hertsgaard, North Dakota State University, "Effects of Coal Development on Agriculture and Rural Communities in the Northern Great Plains"

Group VII.—Economic Policy

Chairman: Loyd Fischer, University of Nebraska

Papers: R. Gady, Federal Reserve Bank of Cleveland, and A. Minden, Purdue University, "Government Acreage Retirement Programs: A Catalyst for Farm Growth?"

F. L. Hoff, USDA, and G. L. Bradford, University of Kentucky, "Impact of Burley Tobacco Price-Quota Adjustment on Income Distribution"

K. Gertel, USDA, "The Value of Additional Grain and Cotton Under Supply Management"

L. Quance, B. Burnham, L. Schluntz, and A. Howell, USDA, "1980 and Beyond: The Impact of Zero Population Growth and Alternative Export Levels on Cropland Requirements in U. S. Agriculture (Preliminary Results)"

J. B. Hottel and J. R. Martin, USDA, and D. S. Moore, Texas A & M University, "Erroneous Inferences Regarding the Impact of Government Programs on Rice Producers: Comparative Analysis of Aggregate, Mean and Structural Data"

Group VIII.—Marketing and Price Analysis

Chairman: GARY FAIRCHILD, University of Florida

Papers: R. E. Jacobson, Ohio State University, and T. F. Graf, University of Wisconsin, "Resolving Pooling, Pricing and Equity Problems Resulting From Grade B Milk Conversion, and Uneven Class 1 Utilization"

R. L. Beck and R. G. Alvis, University of Kentucky, "The Impact of Private Label Brands of Milk on Competition in Fluid Milk Markets"

M. J. Phillips, USDA, "How U. S. Dairymen View Their Industry's Problems and Programs in the Early Seventies: A Six-State Analysis with Emphasis on the Central United States"

J. W. Wysong, University of Maryland, and M. Y. Seyala, Federal City College, Washington, D. C., "An Evaluation of Dairy Farm Adjustment Potentials Using Cross-Sectional and Time-Series Analyses"

H. B. Metzger, University of Maine, "A Review of Marketing Research at State Agricultural Experiment Stations"

Group IX.—General Agricultural Economics

Chairman: ALAN RANDALL, New Mexico State University

Papers: E. Melichar, Federal Reserve System, Washington, D. C., "Rural Banks and the Federal Reserve's New Seasonal Borrowing Privilege"

W. O. Champney and C. T. K. Ching, University of Nevada, "Credit Projections with Explicit Consideration of Changes in Firm Size Distributions"

T. H. Allison Jr., Central Washington State College, "A Computer Model for Analyzing Cobb-Douglas Production Functions: An Aid to Teaching"

G. C. Himes and D. E. Hahn, Ohio State University, "Evaluation of Student Performance from the Use of Computer Assisted Instruction for Teaching Introductory Principles of Production Economics"

J. R. Black, D. Hillman, and S. B. Harsh, Michigan State University, "Some Recent Developments in Computerized Ration Formulation"

Group X.—Extension Education

Chairman: RONALD HENDRICKSON, Washington State University

Papers: K. D. Duft, Washington State University, "An Aid to Performance Evaluation in Agribusiness Management Extension"

G. A. Harrison and R. J. Rades, Purdue University, "Delivery Systems for Computerized Farm Management Aids in Extension: Opportunities and Challenges"

D. E. Erickson, University of Illinois, "Users' Experience with Touchtone Telephone Computer Terminals on an Interstate Share Basis"

B. Eleveld and L. Rogers, Washington State University, "Disinvestment from Farming: A Farmer's Decision Model"

R. O. Coppedge and A. G. Nelson, Oregon State University, "Considerations for Extension Low-Income Program Design: Results of a Preliminary Survey"

Group XI.—Economic Policy

Chairman: THOMAS STOUT, Ohio State University

Papers: G. R. Campbell and M. Hayenga, Michigan State University, "Vertical Coordination Shifts in the Hog-Pork Subsector"

J. C. Snyder and W. V. Candler, Purdue University, "Quantitative Estimates of the Incentives for Structural Change in the Hog Industry"

L. Martin and A. C. Zwart, University of Guelph, "A Recursive Spatial Analysis of the North American Pork Sector with Special Reference to Canadian Policy Implications"

J. M. Sprott, Texas A & M University, "Interregional Competition and Adjustments in the Hog-Pork Industry"

Group XII.—Economic Policy

Chairman: MAX LANGHAM, University of Florida

Papers: B. M. Buxton and J. W. Hammond, University of Minnesota, "Social Cost of the Dairy Price Support Program"

R. G. Heifner, ERS, USDA, "The Social Cost of Instability in Hog Production"

G. P. Kutcher, International Bank for Reconstruction and Development, "Minimum Wages and Social Welfare in Agriculture: Results from a Programming Study of Mexico's Pacific Northwest"

D. G. Devine, Ohio State University, "Industrial Organization, Public Choice and Information Theory: A Framework for Public Policy"

Group XIII.—General Agricultural Economics

Chairman: LARRY CONNOR, Michigan State University

Papers: W. D. Crowley, ERS, USDA, "Anticipated Rent and Property Value Increases and Their Influence on the Apparent Low Rates of Return on Farmland Investments"

R. D. Reinsel, ERS, USDA, "Land Rents, Values and Earnings"

J. Gellner, Agriculture Division, Statistics Canada, "An Alternative Data Source for Selected Farm Financial Statistics"

V. L. Harrison, ERS, USDA, "Effect on Farms of Taxing Capital Gains at Death and at Time of Gift"

Group XIV.—General Agricultural Economics

Chairman: MELVIN WAGNER, University of Illinois

Papers: W. Lin, Stanford University, "Agricultural Growth and Economic Development in Taiwan—A Study of Sectoral Flows and Linkages"

I. Shariff, University of Wisconsin, Green Bay, "Food Crisis and the Agricultural Development Problem in India"

C. Y. Ahn and I. J. Singh, Ohio State University, "The Future of Agriculture in Southern Brazil: Some Policy Projections with a Dynamic Regional Model of the Wheat Region, Rio Grande Do Sul (1970–1985)"

Group XV.—Farm and Firm Management

Chairman: RICHARD DUVICK, Ohio State University

Papers: J. T. Scott, University of Illinois, and J. R. Kleibenstein, Northwestern Missouri State University, "Assessment of Risk When Contract Crops are Included Among Other Crop Alternatives"

S. K. Moak, University of Richmond, "Farm Management and Incentive Problems in North Korean Collective Farms"

A. A. Araji, University of Idaho, "The Effect of System and Size on the Production Efficiency of Beef Cattle Operations"

R. D. Krenz, W. G. Keid Jr., and H. G. Sitler, ERS, USDA, "Economies of Size in Wheat Farming in the Great Plains"

R. L. Berry, South Dakota State University, "Economics of Single Versus Multiple Plant Farms for Crop Production"

Group XVI.—Marketing and Price Analysis

Chairman: LARRY MARTIN, University of Guelph

Papers: L. D. Hill and R. E. Uhe, University of Illinois, "Farmers' Marketing Strategies for Corn Sales in Illinois"

P. A. Anderson, Cargill Investor Services, Inc., and P. L. Farris, Purdue University, "Estimates of the Price of Storage in Futures Markets for Soybeans, Corn and Oats"

J. L. Baritelle, ERS, USDA, and D. W. Price, Washington State University, "Supply Response and Marketing Strategies for Deciduous Tree Crops"

F. E. Walters and S. R. Moore, Colorado State University, "The Food Retailing Industry: Demand, Prices, and Market Concentration"

P. E. Nelson Jr. and L. Britt, ERS, USDA, "Diversification in Five Food Processing Industries and the Farm Machinery and Equipment Industries, 1954–1967"

Group XVII.—Rural and Community Development

Chairman: JAMES BARRON, Washington State University

Papers: R. Barrows and R. Shaffer, University of Wisconsin, "Toward Indicators of Rural Development"

C. Moser, Michigan State University, "Experience of the Emergency Employment Act in 'Balance of State' Michigan: Some Implications for Revenue Sharing in Rural Areas"

L. P. Fettig, University of Illinois, "Per Capita Expenditures by Units of Local Government: Implications for Revenue Sharing"

T. E. Dickinson and W. E. Johnston, University of California, Davis, "An Evaluation of Owner's Expectations of Building Within Remote Rural Subdivisions: Impacts on the Rural Community"

J. W. Fort and J. C. Hite, Clemson University, "Possibilities for Synthesizing Input-Output Coefficients for Small Areas in Rural Development Research"

Group XVIII.—Natural Resource Economics

Chairman: LOYD FISCHER, University of Nebraska

Papers: D. Kraft and N. K. Whittlesey, Washington State University, "Cost Effectiveness of Alternate Externality Policies to Abate Non-Point Type Residual Emissions"

L. L. Jones and J. P. Hall, Texas A & M University, "Solid Waste Management Practices and Costs in Rural Texas Communities"

W. D. Seitz, University of Illinois, "An Economic Evaluation of Sewage Sludge on Strip-Mined Land"

W. Gray III and D. A. West, Washington State University, "Job Creation and Population Redistribution Aspects of Large Irrigation Projects: A Case Study"

J. A. Jaksch, U. S. Environmental Protection Agency, "Outpatient Medical Costs Related to Air Pollution in the Portland, Oregon, S. M. S. A."

Group XIX.—Natural Resource Economics

Chairman: J. E. WIEBE, Alberta Department of Agriculture

Papers: D. R. Fitzsimmons and J. R. Garrett, University of Nevada, "Estimation of Price Elasticity of Demand for Domestic Water in Las Vegas, Nevada—A Personal Interview Approach"

W. E. Martin, R. L. Gum, and A. H. Smith, University of Arizona, "Including Alternative Activities in Estimating the Demand for and Value of Rural Outdoor Recreation"

D. R. Talhelm, Michigan Department of Natural Resources, and P. V. Ellefson, Society of American Foresters, "Economic Evaluations of Sport Fishing in Michigan: A Comparison of Methods and Their Application"

C. R. Shumway, North Carolina State University, "Derived Demand for Regional Resources"

F. L. Olson, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, "Using Prices in Fisheries Management"

Group XX.—Rural and Community Development

Chairman: NEILL SCHALLER, Farm Foundation, Chicago

Papers: C. T. Chen and J. T. Scott Jr., University of Illinois, "Stochastic Analysis of Occupational Mobility of Labor in a Rural Area"

D. K. Larson, ERS, USDA, "Occupational Mobility Patterns of Farmers and Farm Laborers Between 1965–1970, Western States"

E. N. Anderson and R. Y. Watada, University of Hawaii, "Demarginalization: Training Efforts in Rural Societies"

T. Dobbs and P. Kiner, University of Wyoming, "Location Aspects of a Rural Work Force: The Wyoming Uranium Industry"

H. D. Radtke, University of Nevada, Reno, "Allocation of Physicians in the Pacific Northwest Using Marginal Analysis"

Group XXI.—Economic Policy

Chairman: JOSEPH RICHTER, University of Alberta

Papers: W. E. Huffman, Oklahoma State University, "A Cross-Sectional Analysis of Nonfarm Work of Farm Operations"

E. I. Reinsel, ERS, USDA, "Farm Family Incomes Improve: Farmers Scarcely Keep Up"

E. J. Hanson, Southern Illinois University, and R. G. F. Spitze, University of Illinois, "Off-Farm Income as a Factor in the Improvement of Low-Farm-Income Farmers"

T. A. Carlin, ERS, USDA, "Income and Occupations of Southern Rural Blacks: Changes During the 1960's"

Group XXII.—Economic Policy

Chairman: ROBERT E. OLSON, South Dakota State University

Papers: S. D. Tripp, ERS, USDA, "Country Size and World Trade: A Statistical Analysis"

R. S. Andersen, Ohio State University, "The Theory of Public Choice: An Application in International Trade Policy"

R. E. Capel and L. R. Rigaux, University of Manitoba, "Demand Analysis for Canadian Wheat Export Policy: A Progress Report"

B. W. Cone, Pacific Northwest Laboratories, "An Accumulative Analysis of the Demand Response for Fertilizer"

R. C. Kite, ERS, USDA, and J. C. Snyder, Purdue University, "An Interregional Analysis of Livestock Use of Selected Feed Ingredients"

Group XXIII.—Methodology

Chairman: GORDON ROSE, South Dakota State University

Papers: D. R. Henderson, Ohio State University, and D. M. Bell, ERS, USDA, "H_0: Group Research Leads to Improved Performance"

T. L. Sporleder, R. E. Branson, and C. E. Gates, Texas A & M University, "Sample Size Requirements for Generic Product Delivery Measurement in Metropolitan Markets"

R. C. Angus and T. C. Daniel, University of Arizona, "Applying Theory of Signal Detection in Marketing: Product Development and Evaluation"

H. J. Kim and C. S. Thraen, South Dakota State University, and J. E. Wiebe, Alberta Department of Agriculture, "A Practical Application of a Test of Significance in Cluster Analysis"

J. G. Feaster and G. B. Perkins, ERS, USDA, "A Methodology for Estimating Minimum Impact of Food Stamps on Food Expenditures of Low-Income Families and on the Aggregate Demand for Food"

Group XXIV.—Methodology

Chairman: I. J. SINGH, Ohio State University

Papers: P. B. R. Hazell and P. L. Scandizzo, International Bank for Reconstruction and Development, "Competitive Demand Structures Under Risk in Agricultural Linear Programming Models"

R. K. Sahi, Canada Department of Agriculture, and W. J. Craddock, University of Manitoba, "Estimation of Flexibility Coefficients for Recursive Programming Models: Alternative Approaches"

P. J. Barry, R. E. Whitson, and D. R. Willmann, Texas A & M University, "Firm Growth and Resource Adjustment in a Control Theory Setting"

R. G. Hoffman and T. N. Barr, ERS, USDA, "An Analysis and Simulation of Effects of Policy Variables on the Supply and Demand for U. S. Wheat"

FIRST AWARD PAPER IN THE UNDERGRADUATE STUDENT ESSAY CONTEST

Externalities and Open Field Burning: A Case Study

DICK WEDIN

GRASS SEED GROWERS in the Willamette Valley contribute $35 million in gross sales annually to Oregon's economy. In 1972, 260,000 acres of grass seed crops were grown in the Willamette Valley. An estimated 148,000 acres are devoted to the production of both annual and perennial ryegrass, accounting for *all* ryegrass grown in the United States. The remaining 102,000 acres include the production of bentgrass, red fescue, chewings fescue, tall fescue, and Merion-Kentucky bluegrass grown for seed. The Willamette Valley produces approximately 50 percent of U. S.-grown bentgrass, 70 percent of the red fescue, and 95 percent of the chewings fescue [3, p. 4].

The Willamette Valley extends southward from Portland to a range of foothills south of Eugene—a total of 130 miles. It is bounded on the east by the Cascade Mountain range, and on the west by the Coastal range. Within these confines are found the major industrial centers of the state with 70 percent of the state's population of 2.1 million people, but only 14 percent of the state's land base. The geographic and demographic characteristics of the Willamette Valley add to the valley's major environmental quality problem—open field burning.

The practice of open field burning has been used by the grass seed growers since the early 1940's. Field burning has proven to be an effective economic means for destroying blind-seed and ergot fungus, nematode, rusts, smut, and for eliminating grass seed residues (1.5 to 7 tons per acre) in annual and perennial crops grown in the Willamette Valley. On the other hand, the practice of field burning has become a "burning" issue in the Willamette Valley within the last four years. Heavy smoke emissions from field burning create serious problems for all metropolitan areas in the valley, but especially in the Eugene-Springfield area. In the summer, when burning is done, winds from the northwest force much of the valley's smoke into the Eugene area. Therefore, temperature inversion layers that prevent upper-atmospheric mixing and dispersion assure that smoke-filled air is retained in the Eugene area. The reduced visibility, due to the smoke, has increased traffic accident rates on highways, raised the ire level of property owners who complain of soiling problems and nuisance effects resulting in decreased property values, and which may have increased the incidence of respiratory ailments, particularly from patients having previous respiratory illness [3, p. 5].

To bring open field burning under governmental control, Governor Tom McCall signed Act No. 563 into law on June 29, 1971. It contains major legislative changes, in both policy and direction, on the field burning problem. The stated purpose of the Act is to phase out open field burning in the Willamette Valley as soon as a feasible alternative method of field sanitation is available. At the present, the Oregon State University Agricultural Engineering Department is conducting research on a pollution-free mobile field sanitizer, but the development is still in the experimental stage. The Act also provides that, in any case, ". . . after January 1, 1975, no person shall open burn" grass or cereal grain fields in the Willamette Valley.

This law gave authority for the Department of Environmental Quality (DEQ) to manage field burning until 1975. The issuance of burning permits is determined by the DEQ weighing the economic consequences, the feasibility of alternative actions, and considering weather conditions and other factors necessary to protect the public health and welfare [4]. The Act also created a $0.50 per acre service cost to the grass seed growers. That is, the $0.50 covers the cost of clerical help related to regulating field burning, covers the cost of monitoring field burning by an airplane (operated by the Oregon Seed Council), and supports the development of a feasible alternative to field burning.

Pareto Equilibrium and Field Burning

The costs imposed by the grass seed growers onto the nonfarm sector provide an excellent example for "externalities," a concept which dominates theoretical welfare economics and, in

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one sense, the theory of economic policy in general.[1] To illustrate the concept of externalities, a simple descriptive model will be used. Consider two people, the grass seed grower (*G*) and a nonfarm individual (*N*) living in the Willamette Valley. Note that firms or social groups may be substituted for these "individuals" without modifying the central conclusions. Let us assume that *N* receives disutility from field burning up to a certain limit. Beyond this limit, *N*'s total utility does not change with *G*'s intensity of burning. That is, *N* is wholly indifferent to marginal changes in field burning when his visibility of the mountain ranges is totally blocked out or the nuisance effects are beyond repair. *G*'s utility increases with the intensity of the field burning, up to a reasonably high level. In this example, *G*, the grower, possesses the only control over field burning and the associated level of air pollution.

The utility patterns for *G* and *N* are shown in Figure 1 in an Edgeworth box-like diagram. You will notice that the origin for *G* is shown at the upper left, rather than the upper right corner of the diagram. This modification is necessary here because the intensity of field burning, measured along the ordinate, is not strictly divisible between *G* and *N*. That is, both *G* and *N* must adjust to the same level of the pollutant.

As outlined above, the indifference maps for *G* and *N* take the shapes *gg*, g^1g^1, and *nn*, n^1n^1, respectively. You will notice that *G*'s indifference curves are shown as exhibiting diminishing marginal rates of substitution, and *N*'s as constant rates of substitution. In our model we assume that the nonfarm individual can and does notice additional increments of field burning. He will notice, let us say, 50-acre increments, by his reduced visibility of the mountain ranges. While this assumption is applicable to our model, it becomes apparent that there needs to be research on how externalities such as the emission of smoke affect individuals' satisfaction. These contours reflect the relative evaluations for *G* and *N* of money and field burning. Of course, Figure 1 does not reflect costs involved in the activity of field burning.

Figure 2 shows the marginal evaluation curves for *G* and *N*, as derived from the preference map shown in Figure 1, along with an incorporation of costs. These curves are derived as follows. Assume an initial distribution of "money" between *G* and *N*, shown at *M* in Figure 1. The marginal evaluation of the activity for *N* is then derived by plotting the mirror image of the slopes of the indifference curves attained by *N*, and *G* is assumed to increase the level of burning from zero. These values remain negative for a range, then return to zero again for reasons explained earlier.

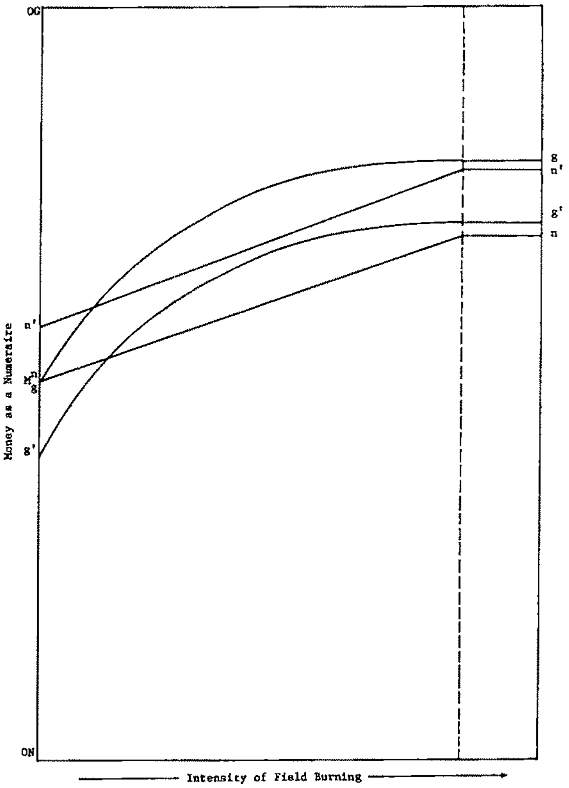

Figure 1. Edgeworth-like diagram

G's curves of marginal evaluation are measured downward from the horizontal axis. We may plot *G*'s marginal evaluation of the activity from the mirror-image of the slopes of his indifference contours attained as he intensifies burning to higher levels. However, the derivation of *G*'s marginal evaluation curve is more complex than that for *N*. This is because *G*, who pollutes the air, must also bear the costs of getting the field burning done. Thus, as *G* increases the scope of the activity, his real income, measured in terms of his remaining goods and services, is reduced. This change in the amount of remaining goods and services will affect his marginal evaluation of the burning. The marginal cost of field burning will affect the net marginal evaluation by him of the burning. This can be demonstrated in Figure 2. If *G*'s burning were costless, then he would push burning to

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[1] The primary theoretical concepts in this section and the next are drawn from [1].

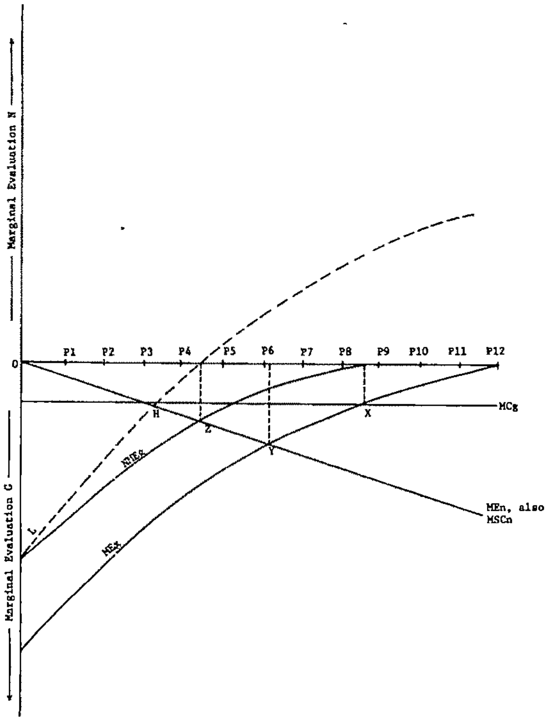

Figure 2. G and N's utility curves with cost

P12, i.e., where his marginal evaluation curve, *MEg*, equals zero. However, *G* must bear the cost of burning. We assume that his marginal costs are constant, as shown by the curve *MCg*. Now, when *G* incorporates his marginal costs, he will only push burning to *P9*, i.e., where his "net" marginal evaluation curve (*MEg* curve minus *MC* curve) equals zero. Thus, *G* will be in "private" equilibrium at *X*, i.e., where his marginal costs are equal to his own marginal evaluation. However, *G*'s equilibrium at *X* is clearly within the range of marginal external diseconomies for *N*, i.e., *G*'s equilibrium position has the total effect of being harmful to *N*.

If the transaction costs of negotiation between *N* and *G* are costless, then *N* will have the desire to modify *G*'s behavior in reducing the intensity of the burning. Thus, *N* could pay *G* money in exchange for reducing his burning from *X* to *Z*. *G* would be willing to reduce his burning to *Z* if the sum of money offered him by *N* would be greater than what he would lose by reducing the intensity of his burning. Pareto equilibrium, i.e, the point where neither party can be made better off without making the other worse off, will be reached at *Z*, where the marginal evaluation of *N* is equal in absolute value, but negatively, to the "net" marginal evaluation of *G*, drawn as the curve *NMEg*. Pareto equilibrium is attained when the marginal rates of substitution in utilization for the two persons are precisely offsetting.

Implications of the Model

The model makes it clear that externalities may remain, even in Pareto equilibrium. That is to say that a position may be classified as Pareto-optimal, or efficient, despite the fact that, at the margin, the activity of burning by *G* affects the utility of *N*. Let us return to Figure 2. Pareto equilibrium is attained at *Z*, yet *G* is imposing marginal external diseconomies on *N*. This point has significant policy implications, for it suggests that the observation of external effects, taken alone, does not provide a basis for judgment concerning the termination of field burning. This means that the internal benefits from carrying out the activity, net of costs, may be greater than the external damage that is imposed on other parties. In full Pareto equilibrium these internal benefits, measured in terms of the benefits from field burning accruing to *G*, net of costs, must be just equal, at the margin, to the external damage that is imposed on *N*.

The second point of this analysis is the reciprocal nature of the problem. The smoke nuisance of field burning is caused both by the grower who lights the fire *and* by the individual who lives nearby. Given the field burning, there would have been no smoke nuisance without the houses, people, etc. Given the houses, people, etc., there would have been no smoke nuisance without the field burning [2, p. 13]. The fact is that there are always two parties involved in a single externality relationship.

To illustrate this point, assume that *N*, the externally affected party in our example, secures, through the auspices of the state, the levy of a marginal tax on *G*'s intensity of burning. Assume further that *N* is able to secure this tax without cost to himself. The tax will increase as the intensity of burning increases. It is levied on *G* to reflect the negative marginal evaluation of the burning to *N*. Now the effective marginal cost, as confronted by *G*, may be shown by the curve, *MSCn*, in Figure 2. A new "private" equilibrium for *G* is shown at the quantity *Z*, the same level designated as Pareto equilibrium. However, the position, if attained in this manner (in contrast to the private bargaining between the two parties), is neither one of Pareto optimality, nor one that may be classified as a Pareto equilibrium.

In this case, *N* is not incurring any cost in securing the change in *G*'s behavior. Since *N* remains subject to marginal diseconomy, further "trade" can be worked out between the two parties. If a unilaterally-imposed tax, corresponding to the marginal evaluation of *N,* is placed on *G*'s performance of the burning, the new position of Pareto equilibrium may be shown by first subtracting the new marginal cost curve, drawn as *MSCn,* from *G*'s marginal evaluation curve. Where this new "net" marginal evaluation curve, shown as the dotted curve between points *L* and *P5,* cuts the marginal evaluation curve for *N,* a new position of Pareto equilibrium falling between *H* and *P5* is located.

The important implication to be drawn is that full Pareto equilibrium can never be attained via the imposition of unilaterally-imposed taxes and subsidies until all marginal externalities are eliminated. If a tax subsidy method rather than "trade" is to be introduced, it should involve bilateral taxes (subsidies). Not only must *G*'s behavior be modified so as to insure that he will take the costs externally imposed on *N* into account, but *N*'s behavior must be modified so as to insure that he will take the costs "internally" imposed on *G* into account. In such a double tax-subsidy scheme, the necessary Pareto conditions would be readily satisfied.

In summary, full Pareto equilibrium cannot be attained so long as marginal externalities remain, until and unless those benefiting from changes are required to pay some "price" for securing the benefits. The reader may ask what would happen if *N* had the sole legal right to enjoy clean air. The lack of space does not permit a demonstration of the argument, but it remains that the basic characteristics of the Pareto equilibrium position remain unchanged, regardless of authority.

Conclusion

With respect to the Willamette Valley field burning problem, two important conclusions can be derived from the above theoretical analysis:

1. An "efficient" solution to the field burning problem would not eliminate externalities altogether. Externalities would remain, even at Pareto equilibrium.
2. If it were possible to estimate correctly the social costs of field burning, and if these costs were imposed on farmers through a unilateral tax, Pareto equilibrium would *not* result.

The preceding discussion assumes that transaction costs, the costs of organizing firms and individuals into one problem-solving unit, are costless. Of course, in reality this assumption is meaningless. In our example, the transaction costs of gathering 2,000 farms and 1.5 million people in the Willamette Valley to bargain with each other would be astronomical. Hence, government was brought in to regulate field burning. This is not to say that government regulation is costless either, but it does have the sources of revenues and the police power to manage such a public issue.

Our analysis does provide insights into an important issue in the problem of field burning. When the Oregon legislature convenes in 1974, it may want to revamp the field burning law.

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ABSTRACTS OF AWARD-WINNING THESES

Doctoral Theses

John William Freebairn, ***Some Adaptive Control Models for the Analysis of Economic Policy: United States Beef Trade Policy*, University of California, Davis, 1972.**

Economic policy making may be viewed as a process of sequential decision making under conditions of uncertainty. This study formalizes the economic policy problem in the framework of an adaptive control model. Some alternative adaptive control models are reported and evaluated. One of these models is applied to an analysis of United States beef trade policy concerning the maximum annual level of beef imports.

An adaptive control problem is basically a dynamic optimizing model. The most general problem considered is formalized as follows: find the set of conditional decision strategies $u_t^a(y_{t-1}, P^{t-1})$ to maximize

$$
\begin{aligned}
(1) \qquad SPF = E \sum_{t=1}^{T} D^{t-1}(2k'_t y_t + 2h'_t u_t \\
- y'_t K_t y_t - u'_t H_t u_t - 2y'_t L_t u_t \\
+ w'_{T+1} y_T - y'_T W_{T+1} y_T),
\end{aligned}
$$

subject to:

$$(2) \qquad y_t = A_t y_{t-1} + B_t u_t + C_t x_t + e_t \quad \text{and}$$

$$(3) \qquad P^t = I(P^{t-1}, y_t, y_{t-1}, u_t, x_t),$$

given

$$(4) \qquad y_0 = y(0) \quad \text{and} \quad P^0 = P(0)$$

where y is a vector of state variables, u is a vector of policy instrument variables, x is a vector of other noncontrollable exogeneous variables, and e is a vector of random error terms. Equation (1) is an objective function with known parameters D, k, h, K, H, L, w, and W; (2) is a set of state transformation functions whose coefficients A, B, and C are unknown, but the policy maker is assumed to have a probability distribution function, denoted by P, for these uncertain coefficients and for the error terms in e; (3) is an information updating function, such as Bayes Rule, for using new sample information to update the estimated moments of the probability distribution function P; and (4) describes the initial conditions. Particular attention in the study is given to estimation of the objective function, to the information updating function, and to solving for the adaptive decision strategies $u_t^a(y_{t-1}, P^{t-1})$.

Dynamic programming procedures are used to solve the control problem represented by relations (1) through (4). Since analytical solution procedures could not be found, and since the applicability of numerical search procedures is restricted by dimensionality problems, a number of approximate solution procedures are considered. These include the solution of the control problem represented by (1), (2), and (4) as a stochastic control problem. This is achieved by the backwards solution of a set of recursive equations and results in a linear feedback decision strategy of the form

$$(5) \qquad u_t = G_t y_{t-1} + g_t$$

where u and y are as above, and G and g are determined by the solution. Open loop-feedback decision strategies, which are determined by the solution of the control problem as a stochastic control problem for each decision period using the updated estimate of P, recognize uncertainty and the control and learning dimensions of adaptive control strategies, but they ignore the experimental dimension of the latter strategies.

An adaptive control model is employed in an analysis to determine the United States optimum beef import quota strategies for each of the years 1970 through 1975. A set of objective functions which place different trade-off ratios between aggregate consumer meat costs and an aggregate measure of the gross margin returns to beef producers is estimated. The state transformation functions, together with the estimated mean and variance-covariance terms of probability distribution function for the coefficients of these relations, are derived from an econometric model of the livestock sector. The econometric model describes the annual aggregate behavior of individuals involved in the production, consumption, and trade of four meats—fed beef, other beef, pork, and poultry. The stochastic decision strategies indicate that for the objective functions assumed, and for the other assumptions made, it would be socially desirable to increase the level of beef imports above current levels.

Darrel Good, ***Potential Impact of Environmental Pollution Abatement Alternatives on the Michigan Dairy Farming Industry*, Michigan State University, 1972.**

Concern is being expressed by the public, industry groups, and researchers over the contamination and pollution of the environment. Pollution originating from all sources, whether it be municipal, industrial, or agricultural, is receiving attention from local, state, and federal agencies charged with maintaining or enhancing environmental quality.

Over time, the problems surrounding the management of animal waste in such a manner as to prevent environmental contamination have been compounded because of the increased concentration of livestock production into larger and more confined facilities and the increasing numbers of nonfarm residents in traditional farming areas. Although various federal and state statutes have been enacted or proposed to curb environmental pollution arising from animal wastes, more persuasive controls in the form of direct regulation may be expected to originate from state legislatures.

The economic impact upon Michigan dairy farms of compliance with specific legal constraints for animal waste management was evaluated. Impacts of legal constraints upon cost of milk production were first analyzed within a theoretical framework. A linear programming model was established to analyze the impact of specific control measures on "representative" farms in terms of labor requirements, costs of production, and returns to the operator's labor and management. Capital requirements of compliance with the control measures were also determined. Synthesized dairy firms were developed, organized around specified herd size and housing and waste handling systems. These synthesized firms were incorporated into the linear programming model and analyzed under three environmental pollution abatement alternatives:

1. mandatory retention and disposal of surface runoff at the production site,
2. prohibition of winter land disposal of wastes, and
3. mandatory subsurface disposal of wastes.

Compliance with these pollution abatement alternatives requires additional investment in dairy waste handling facilities. The magnitude of these investment requirements varies according to production technology utilized. The warm enclosed housing systems utilizing outside waste storage facilities have the lowest additional investment requirements per cow. The stanchion housing systems require the largest additional investment per cow.

Investment economies accrue to the larger herd sizes. The magnitude of these economies varies by production technology utilized. Depending on production technology utilized, investments per cow are 4 to 15 percent lower for the larger herd sizes than for the smaller herds.

Policy compliance increases total milk production costs, at the present level of output, for all production technology/herd size combination studied. Variable costs of production are reduced only for the stanchion and cold covered housing systems. Total milk production costs are increased the least for the cold covered housing systems and the most for the stanchion housing systems and the 80-cow open lot system.

Returns to operator's labor are reduced by only 5 percent for 160-cow cold covered housing systems, but are reduced by 37 percent for 40-cow stanchion housing systems. This implies that operators of smaller dairy herds, especially those with stanchion housing systems, may be economically disadvantaged by pollution abatement policies of the nature considered in this study to the extent that they will discontinue milk production.

HAROLD SEYMOUR BEEBOUT, ***The Production Surface for Academic Achievement: An Economic Study of Malaysian Secondary Schools***, **University of Wisconsin, 1972.**

A number of studies have estimated the relationship between school resources and educational achievement; however, few have been designed to permit exploration of the economic implications of this relationship. The major research objectives of this study were the development of a model of student academic achievement from an economic perspective, the utilization of the economic model to estimate a production surface for academic achievement from Malaysian data, the application of the estimated surface to an analysis of the resource allocation problem, and the examination of the allocation implications to determine their economic reasonableness.

A conceptual model was developed from a set of working hypotheses relating the school output to three clusters of inputs, i.e., the student's background, the outside-the-school environment, and the inside-the-school environment. A major component of the student's background at the secondary school stage is his achievement in the previous primary school stage. How conducive the inside-the-school environment is toward producing the output of academic achievement is assumed to depend on the level and combination of the school inputs. The outside-the-school environment included the location of the school district, the father's occupation, and the student's ethnic group.

The data source was the E.P.R.D. Secondary School Survey. This survey was sponsored by the Malaysian Ministry of Education and comprised a stratified random sample of approximately 8,000 students who were in grade eleven in 1969. Scores for each student on a battery of achievement tests given at the end of lower secondary school and again at the end of upper secondary school were included along with detailed information on the level of school inputs such as the qualifications of the teachers, class size, library use, etc.; on the cost of the school inputs; on the community; and on the student's background. The data are thus somewhat unique allowing educational inputs to be related to both cost and indicators of educational performance at two points in time.

An empirical model was developed from the conceptual model in the form of a statistical production function and the parameters of the production surface for academic attainment were estimated by ordinary least squares. By far the most important predictor of academic achievement was the student's entering achievement score. Among the school input variables, teacher experience and qualifications interacted so that the effect of one depended on the level of the other. Untrained teachers were associated with low achievement, while more library use was associated with increased achievement.

The implications of the estimated surface for the efficiency of the input mix were examined in terms of change in achievement per input dollar (cost-effectiveness ratio) for a small increment to the budget. Reducing the percentage of untrained teachers appeared to have an especially favorable cost-effectiveness ratio. Realizing that boarding schools may be serving other objectives not included in this study, i.e., permitting remote students to attend school, they appeared to have a particularly unfavorable cost-effectiveness ratio. By defining schools with low levels of teacher inputs as "poor" and schools with high levels of teacher inputs as "good," estimates of the impact on achievement of changing the input levels of the "poor" schools to the level present in the "good" schools were substantial, but less than generally expected because of offsetting input levels. Concerning economies of scale, the average cost curve for secondary schools showed cost per student falling rapidly at low enrollments and then declining at a decreasing rate until the curve became almost flat at an enrollment of two thousand students.

The empirical model explained up to 65 percent of the variance in student achievement and performed well when tested against three comparative models. The empirical results of the model and their implications for resource allocation generally appeared to be reasonable from an economic perspective. This study concludes that the use of this type of a model is a promising approach to resource allocation in education although additional research is needed on the specification of the theoretical model and on the specification of the multiple outputs of schools.

GUSTAVO A. NORES, *Structure of the Argentine Beef Cattle Economy: A Short Run Model, 1960–1970*, Purdue University, 1972.

To understand the short run structure and price formation mechanism of the beef cattle economy is extremely important in Argentina. Large fluctuations characterized by a strong cyclical path, which has been observed in the real price of beef cattle, constitute an important source of disturbance in the overall economy. This study focuses on the analysis of the industry's short run structure in an effort to understand its dynamic characteristics and to explain the observed price fluctuations. Special attention is given to the evaluation of specific policies such as exchange rate policy, rationing, maximum retail prices, and credit policy which had been implemented during the last decade.

The economic model is based on a theory of investment behavior of producers and on traditional demand theory. Four statistical models were specified and estimated. These differ in (a) the level of aggregation of slaughter supply equations, (b) whether or not average slaughter weights are regarded as variables or assumed to be constant at mean sample values, and (c) whether or not domestic demand and demand for exports are specified at the farm level or at the final retail and FOB levels when the behavior of intermediaries and of export packers is explicitly taken into consideration. The interdependency among the large components of the beef cattle economy is analyzed on the basis of the most aggregated model.

All four models are specified as simultaneous systems of linear equations in which slaughter volume and quantities consumed and exported react to and determine price. These models correspond to simultaneous equations blocks of more complete block recursive systems, in which the other block(s) are formed by an equation explaining the inflow of animals to the herd (the number of calves born) and stock accounting equations connecting stocks and flows.

The empirical evidence indicates that slaughter of different categories of animals are characterized by seasonal patterns reflecting the seasonality in births and pasture availability. Availability of pastures varies with the season and so does slaughter response to price changes. In the short run and in the absence of pasture constraint, the slaughter of all categories of animals (including steers) decreases as beef prices go up or input prices go down. This constitutes new and solid evidence that not only do cattle producers respond to price changes in the expected direction but also that they respond promptly (within the quarter) and in significant magnitude.

The empirical evidence also indicates that farm prices are, in the short run, highly sensitive to both real wage rate and net effective exchange rate. This has strong policy implications since, under the present system, the levels of these variables are either set or highly influenced by government decision. As beef prices go up, exports, which are more price elastic than domestic demand, start declining. This induces the government to devalue (reduce export duties or increase export subsidies) in an attempt to maintain the level of exports. The quantity adjustment is thus forced into domestic consumption. Since domestic demand is rather inelastic with respect to price and slaughter reacts inversely to price, the required adjustment in price to clear the market is larger than the initial increase. At the new price level a further devaluation is needed to maintain the level of exports. This process continues until the new output from an increased herd reaches the market. In summary, exchange rate policy directed toward stabilizing beef exports results in distabilization of price.

Master's Theses

DANIEL LEONARD, *Some Economic Aspects of Reclaiming Strip-Mined Land with Digested Sludge*, University of Illinois, 1972.

This study develops a method for a benefit-cost analysis of restoration of strip-mined land to agricultural production in which the restoration process includes the application of digested sludge. An empirical application of the method is made in an area of Fulton County, Illinois, strip-mined land with sludge processed by the Metropolitan Sanitary District of Greater Chicago (MSD). A simulation model is developed and used to determine these costs and benefits.

The range of possible agricultural products is restricted to four crops which are described by adapted enterprise budgets. The critical parameter to be estimated is the productivity of the land after restoration. This productivity determines yields and land values. The model also requires an estimate of the structure of consumption expenditures in Fulton County. A local income multiplier is derived. Local benefits are then estimated as a function of the productivity of the reclaimed land for alternative crops.

The sludge application schedule is derived from crop assimilative capacity for nitrogen per bushel of yield, land productivity, and a constraint on nitrate leaching. Benefits and costs to the MSD per ton of sludge applied are estimated from available data. The general model developed permits the evaluation of complex long term sludge application programs, but it is applied in a relatively simple case because of the lack of refined data on processing and reclamation costs. Various efficiency criteria are used to integrate all benefits and costs and, in the particular application in Fulton County, continuous corn is selected under specified assumptions.

Sludge application schedules, nitrate leaching rates and benefits are presented in appendix tables for various productivity levels and crop rotations.

MARSHALL ALLEN MARTIN, *The Income Distribution Impacts of the Adoption of Mechanical Harvesting of Cotton in the United States*, Purdue University, 1972.

A primary ingredient in the increased productive capacity of the United States' agricultural sector in recent years has been the adoption of new technologies. They have included both labor-saving as well as capital-saving technologies. Only since World War II has efficient, economical harvesting equipment become available for cotton harvesting. Although historically cotton has been a very labor-intensive crop, with the adoption of the mechanical cotton pickers large numbers of southern farm workers have been displaced.

The purposes of this study were three-fold: (1) develop an analytical framework for studying the income distribution impacts of technological change; (2) ascertain the economic welfare impacts to U. S. consumers, U. S. producers, and the net welfare change to U. S. society from the adoption of mechanical cotton harvesters; and (3) determine the effects of the new technology on the regional factor markets with special emphasis on land and labor. The Lerner-Pearce model proved to be a powerful analytical tool. The initial results suggested by it were entirely consistent with the results obtained in the remainder of the study.

In order to satisfy the latter two objectives, an analytical model based on production economic theory and the unique characteristics of the U. S. and world cotton fiber markets was developed. An econometric model was then specified and estimated. Combination of the results of the analytical and econometric models provided the required information. In a partial equilibrium framework it was ascertained that U. S. as well as foreign consumers of U.S.-produced cotton have experienced a welfare gain as a result of the adoption of the mechanical cotton harvester. U. S. cotton producers have experienced a welfare loss while the net impact on the U. S. society has been a welfare gain.

A review of the results of this and other studies of factor markets suggested that hired farm workers in the U. S. cotton-producing region have borne a major portion of the cost as they were displaced by the mechanical harvesters. Owners of land who were early adopters of the labor-saving technology tended to gain in the short run from increased returns to land. In the longer run, land values tended to decline slightly as the mechanical technology was adopted by most cotton producers.

Past government programs for cotton have permitted the capitalization of the benefits of the programs in higher land values. This has helped to offset the loss to producers. However, less attention has been given to the loss accruing to displaced cotton farm workers. Application of the Hicks-Kaldor compensation principle to the case of U. S. cotton production would mean that those who have suffered losses, i.e., cotton producers and displaced cotton farm workers, would be compensated via not only government cotton programs for producers but also programs to give assistance to the displaced farm workers.

Application of the Lerner-Pearce model, plus an empirical study of this type, should provide a framework for policy makers in developing countries to address themselves to the effects of new technologies not only on productivity but also on their differing impacts on income distribution patterns. Thus before their adoption, the efficiency and equity implications of various new technologies could be examined.

As society becomes more concerned with questions of equity as well as economic efficiency, improved techniques of welfare measurement must be developed. The final chapter suggests some fruitful areas for further research, both theoretical and empirical, to develop more adequate welfare economic measures.

Thomas A. Stucker Jr., ***Effects of Payment Limitations Applied to the Feed Grain Program in the North Central States***, **Purdue University, 1972.**

The recurring interest in rural development focuses attention on farm income. Both the level and distribution of farm income are important to the welfare of rural people. Current commodity programs represent a continuing attempt to raise the level of farm income, but their structural basis of linking payments with production tends to increase the inequities in the distribution of farm income among producers. The application of a limit to the amount that one individual can receive from participation in a particular commodity program should tend to reduce these income inequities, but other effects of payment limits are unknown.

The objective of this study is to estimate some of the effects of limits on Feed Grain Program payments. This study estimates the effect of four payment limit levels on participation in the Feed Grain Program, corresponding program costs, corn production, and farm income. This objective is sought through the use of a dual approach. The effects of the proposed limitations are estimated for the eight states in the North Central Region using both state participant data and simulated farm data. The state participant part of the study is based on historical participation data. Payment distributions from 1971 are used to derive farm conditions with respect to the Feed Grain Program in 1972 and the effect of payment limits on these farms as a group. The simulated farm section of the study uses a linear programming simulation model. Representative farms of four sizes are programmed for each state under varying price conditions and payment limit levels. For Indiana, two levels of support rate are also simulated.

The results from the simulated farm study are then aggregated through the use of a weighting system. This facilitates a comparison with the results from the state participant study. The results indicate that a payment limit of $5,000 per payee per program has a significant effect on participation in the program and crop production. Limit levels of $10,000, $20,000, and $55,000 have relatively minor effects on participation and crop production in the area studied because of farm size.

One main effect of the payment limit is a decrease in acres diverted from crop production. This is due to two reasons. First, decreasing the payment by limiting it may decrease participation in the program. Secondly, diverted acres will decrease if it is assumed that the payment per diverted acre remains constant both with and without payment limits and that the farmer subject to the limit is only required to divert acreage for which he is paid. Without this provision, participation in the program for farms large enough to be affected by the limit would not be a viable alternative to crop production. It was found that when a decrease in diversion occurred due to a payment limit, the increased acreage in production went directly to the crop with the relative return-over-cost advantage.

The results of this study imply that in the North Central Region payment limits of $10,000 and higher applied to the Feed Grain Program affect few producers because of the size of farms in these states. A limit of $5,000 does have a major effect on participation, diversion, and crop production. In the formulation of policy concerning payment limits in the control of crop production, product price relationships must also be given close attention.

AMERICAN AGRICULTURAL ECONOMICS ASSOCIATION REPORTS AND MINUTES

REPORT OF THE PRESIDENT

Elsewhere in this Proceedings Issue will be found detailed minutes of the Executive Board of your Association. I will refer only to certain key actions which have much influenced my tenure as President.

When I became a member of the Executive Board in 1971, I was much impressed by the large number of activities of the Association as compared to my earlier service on the Executive Committee as Vice-President in 1964–65. A majority of the Board believed in August of 1971 that another dues increase was inevitable in the near future unless projected expenditures could be reduced or additional revenue could be tapped, such as a page charge for the *Journal*. Several of us were of the opinion that another dues increase would not be well accepted following so soon after the increase to $15.

As the report of the Treasurer makes clear, a dues increase will not be necessary this year or in the immediate future. Several factors have contributed to this more favorable financial picture. Your Executive Board has been exceedingly conservative with respect to any activities that might result in increased expenditures. The financial management of Association funds by John Redman has been of a very high caliber. The post-World War II literature review does not now appear as likely to create as heavy a demand on the Treasury as was believed probable two years ago. It is believed the change of printers of the *Journal* will also result in a savings of Association funds.

Even though the Association has remained in the black and the outlook for the near future is more optimistic than it was two years ago, the margin is a very thin one. As a consequence, the Executive Board has concentrated this past year on attempting to ascertain the priorities of the Association with respect to its activities. The summary report prepared by Bruce Beattie, which follows this report, is enlightening in this respect. Prior to obtaining the results of the questionnaire, the Executive Board concluded that the situation facing the Association did not warrant the stimulation or initiation of numerous new projects. We concluded that the Association had numerous worthwhile activities and that the current challenge involved efficient execution and consolidation rather than expansion.

The Beattie report makes it quite clear that a large majority of those Association members returning the questionnaire placed an exceedingly high priority on the *Journal*. Perhaps one should not be surprised at this because no other Association activity touches so many people. Even so, it seems important that the leadership of this Association give continuing attention to the maintenance of a quality journal. The results of the questionnaire put an even heavier responsibility on the Ad Hoc Committee for the Evaluation of the *AJAE*, chaired by Stephen Smith.

It is with regret I report a misunderstanding, or a failure of communication, between the Executive Board and the wives of some Association members which developed during the past year. Perhaps the story can best be started at the time of the 1971 annual meeting. At that meeting, one of the regional association representatives to the Executive Board asked the Executive Board to take some action to reduce the burden of hosting women's and children's activities at annual meetings. At a subsequent meeting of the Executive Board, action was taken to permit host institutions, after the 1973 annual meetings, to limit women's and children's activities, if they wished to do so, to the provision of a hospitality room and a list of baby sitters.

During the 1972 annual meeting, the Executive Board discussed a site for the 1977 annual meeting. At that time no invitation had been received from a university to serve as a host in 1977. The Board voted to go to a commercial site in 1977 for experimental purposes.

These two independent actions apparently were interpreted by some as a move on the part of the Executive Board to discourage the attendance of women and children at annual meetings. I am in receipt of a collection of petitions signed by numerous wives of Association members protesting actions which, in fact, have never been taken. Your Executive Board has encouraged me to communicate individually with each person who signed one of these petitions and explain, as carefully as possible, the position of the Board on this matter. I will also express my appreciation, as well as that of the Board, for the input to the decision process of the Association by those wives who signed petitions and wrote letters. Beyond this, permit me to say on behalf of your Executive Board that *women and children are welcome at all of the following sites and locations.* This list exhausts the sites which have been selected to this time.

1974—Texas A & M University, College Station, Texas
1975—The Ohio State University, Columbus, Ohio
1976—Pennsylvania State University, University Park, Pennsylvania
1977—San Diego—a commercial site with numerous family recreational facilities.

The Executive Board also views with approval the conferences being held by representatives of future host institutions with respect to the level of sponsored women's and children's activities. Perhaps by this means, the level of such activities will not go beyond the abilities of small or medium-size departments to host an annual meeting of the Association without undue effort.

I also consider quite significant the report of the Ad Hoc Committee on Student Affairs. Your Executive Board accepted most of the recommendations of this committee which has the effect of changing the focus of education efforts of the Association from the undergraduate student to the undergraduate teacher. It will be the responsibility of future Presidents and Boards to continue to assess these recommendations to decide when implementation is to occur.

The next announcement of Association Awards for Professional Excellence will show significant changes from those of past years. This is the result of recommendations of the Awards Committee under the successive chairmanships of Chester Baker and B. F. Stanton. These changes reflect trends and emerging patterns of thought within the Association as well as the experience which has been gained with the Awards Program. They will be worth trying and evaluating.

I must state here a growing conviction I have about the awards program. Certainly the new awards program deserves a fair trial. However, it is my personal hope that in the not too distant future this Association will discontinue all awards except the Fellows program. It would not be appropriate here to repeat all of the arguments underlying this position. Suffice it to say I believe the maturity of this profession is such that recognition will come to those who earn it, even in the absence of a formal awards program by this Association.

I consider being selected to serve as your President to have been the highest professional honor I have ever received. I have enjoyed, benefited, and have been stimulated by the experience of serving as your President. However, as far as I am concerned personally, the constitutional limitation of one term is unnecessary; one year is enough!

Respectfully submitted,
EMERY N. CASTLE,
President

AAEA QUESTIONNAIRE AND SUMMARY OF RESULTS

Editorial Note: The questionnaire which Emery N. Castle sent to the AAEA membership is reproduced below and followed by a summary of the responses as prepared by Bruce R. Beattie.

AAEA QUESTIONNAIRE

I. My priorities with respect to the following activities of the Association are: (Please rank the six activities in decreasing order of importance to you, such as 1, 2, 3, etc.) If you believe you do not have sufficient information on one or more of the activities to rank them, please skip question I and go on to question II unless you wish to comment regarding one or more of these activities.

——— a. Awards Program
——— b. Post-World War II Literature Review
——— c. Publication of the *Journal*
——— d. Publication of the *Bibliography*
——— e. Education Workshops
——— f. International Travel Grants

Comment:

II. In the event a choice is necessary, I favor: (Vote for one.)

——— Increasing dues
——— Instituting a page charge on *Journal* publication. (Would be imposed on institutions, not individual authors)
——— Decreasing the scope of, or eliminating some Association activity.

III. Activities the Association should sponsor or promote but which it is not now doing are: (Please describe.)

SUMMARY OF RESULTS

Question I.—Association Priorities

Response categories	
No Response	50
Not Usable	21
Partial Information (Ranked fewer than six)	121
Full Information (Ranked all six)	795
TOTAL	987

Partial information summary (121 schedules)

Table 1. Frequency distribution of preference rankings, partial information

	Rank						
	1	2	3	4	5	No rating	Σ
a. Awards	2	23	15	12	0	69	121
b. Post-WW II Lit. Review	1	17	16	5	1	81	121
c. *Journal*	109	8	4	0	0	0	121
d. *Bibliography*	4	39	14	4	0	60	121
e. Education Workshops	4	12	12	0	1	92	121
f. Travel grants	1	2	5	2	0	111	121

Full information summary (795 schedules)

Table 2. Frequency distribution of preference rankings, full information

	Rank						
	1	2	3	4	5	6	Σ
a. Awards	30	219	151	167	144	84	795
b. Post-WW II Lit. Review	19	130	173	179	177	117	795
c. *Journal*	702	55	18	10	5	5	795
d. *Bibliography*	11	246	203	148	115	72	795
e. Education Workshops	28	119	180	178	219	71	795
f. Travel Grants	5	26	70	113	135	446	795
Σ	795	795	795	795	795	795	

Table 2a.* Percentage ranking of preferences, full information

	Rank					
	1	2	3	4	5	6
a. Awards	.04	.27	.19	.21	.18	.11
b. Post-WW II Lit. Review	.02	.16	.22	.23	.22	.15
c. *Journal*	.88	.07	.02	.01	.01	.01
d. *Bibliography*	.01	.31	.26	.19	.14	.09
e. Education Workshops	.04	.15	.23	.22	.27	.09
f. Travel Grants	.01	.03	.09	.14	.17	.56

* Prepared by Emery Castle from data in Table 2.

Table 2b.* Weighted rankings of preferences, full information

	Rank							
	1	2	3	4	5	6	Σ	Weighted Rank
a. Awards								
Weighted Rank	30	438	453	668	720	504	2813	3
b. Post-WW II Lit. Review								
Weighted Rank	19	260	519	716	885	702	3101	5
c. *Journal*								
Weighted Rank	702	110	54	40	25	30	961	1
d. *Bibliography*								
Weighted Rank	11	492	609	592	575	432	2711	2
e. Education Workshop								
Weighted Rank	28	238	540	712	1095	426	3039	4
f. Travel Grants								
Weighted Rank	5	52	210	452	675	2676	4070	6

* Prepared by Emery Castle from data in Table 2.

Comments on Question I.

Questionnaires with one or more comments	64
Questionnaires with no comments	923
TOTAL	987

Classification of comments:

1. Elimination of activities *or* indication of very low priority
   a. Awards, 10
   b. Post-WW II Literature Review, 10
   c. *Journal*, 1
   d. *Bibliography*, 10
   e. Education Workshops, 13
   f. Travel Grants, 24
2. Elimination of all monetary aspects of the Awards Program, 6
3. Comments on the *Journal*
   a. Emphasized importance of the *Journal*, 6
   b. Less "esoteric" format for the *Journal*, 5
   c. Other comments on the *Journal*, 5
4. Unclassified, 16

Question II.—Finances

In the event a choice is necessary, those favoring:

Increasing dues	258
Page charge on the *Journal*	435
Decreasing scope of activity	264
Others	30
TOTAL	987

Questionnaires with no suggestions	864
Questionnaires with suggestions	123
TOTAL	987

Question III.—Activities of the Association

Activities the Association should sponsor or promote but which it is not now doing are:

1. Expand scope and modify nature of the *Journal*	31
2. More emphasis on employment services	13
3. More effort to attract and serve needs of agricultural economists in industry	10
4. More politically active stance	6
5. More emphasis on improving teaching	5
6. Hold the line or reduce number of activities	4
7. Accreditation of graduate and undergraduate programs in agricultural economics and/or certification of professional agricultural economists	3
8. More extension emphasis	2
9. More interdisciplinary emphasis	2
10. Promote academic freedom	2
11. Unclassified (only one comment)	45
SUBTOTAL	123

RESOLUTION

BE IT RESOLVED that the American Agricultural Economics Association expresses its sincere gratitude and appreciation to the Government of the Province of Alberta for financial support for our Annual Meeting held at the University of Alberta, Edmonton, August 8–11, 1973, in conjunction with the Canadian Agricultural Economics Society and the Western Agricultural Economics Association, and for the cordial welcome extended to us by the Lieutenant Governor of the Province; to the City of Edmonton for financial support and for the most excellent cooperation from its Parks Department and its Convention Bureau; to the University of Alberta for a very generous cash grant in addition to the contributions of many of its personnel and the use of its outstanding facilities; to Travis W. Manning, Reginald R. Norby, Murray H. Hawkins, William E. Phillips, and all of the rest of the faculty, staff, students, and wives and friends of the Department of Agricultural Economics who worked long, hard, and successfully in making arrangements that made our stay so pleasant and productive.

BE IT FURTHER RESOLVED that a copy of this Resolution be sent to the Premier of the Province of Alberta, the Lieutenant Governor of Alberta, the Mayor of Edmonton, the President of the University of Alberta, and to key individuals on the Local Arrangements Committee and others at the University of Alberta as appropriate.

REPORT OF THE SECRETARY-TREASURER

The total number of members and subscribers in all categories remained at a high level in 1972, decreasing by only 107 from 1971 (Table 1). The biggest reduction was in the junior members, reducing from 688 to 436. We also had nine fewer institutional members (formerly sustaining members) but had 113 more library subscriptions.

The AAEA had a favorable year as the 1972 operating statement shows a surplus instead of the budgeted deficit (Table 2). Several significant facts need to be considered in analyzing the statement. As you know, such statements show the extraordinary items as a normal operating activity. For examples, we received a $5,000 payment during the year from the Agency for International Development for the American Bibliography sent in 1971 to foreign libraries. The *Journal* sales were unusually high because we were able to piece together two complete sets which I negotiated and sold to a book store for $4,029. In addition, we were able to fill several orders amounting to several hundred dollars each. We also received $3,000 from "profits" of the 1971 Annual Meeting and $833.15 as "profits" of the Allied Social Science Associations. In addition, we received $2,409.11 from sales of the AAEA brochure because of economies realized in printing passed on by the University of Kentucky Printing Department.

Table 1. Number of members and subscribers, 1972, with comparisons

Category		1968	1969	1970	1971	1972
Institutional Members		38	45	39	34	25
Regular Members	—U. S.	2716	2854	2667	2856	2802
	—Foreign	547	566	534	486	601
Junior Members	—U. S.	585	518	494	635	398
	—Foreign	82	61	84	53	38
Corresponding	—U. S.	—	2	4	2	—
	—Foreign	187	179	95	100	82
Libraries & Bus.	—U. S.	594	645	596	619	647
	—Foreign	1024	1090	1031	1111	1196
Exchange		3	3	3	2	2
Total		5776	5963	5547	5898	5791

Table 2. The AAEA 1972 operating statement with comparisons and 1973 budget

Item	1971 Actual	1972 Budget	1972 Actual	1973 Budget
Income:				
Dues and Subscriptions:				
Regular Members	$ 61,433.35	$ 58,000.00	$ 55,645.52	$ 60,000.00
Junior Members	4,293.04	3,000.00	3,441.25	3,500.00
Subscriptions	31,593.57	39,000.00	38,193.82	31,000.00
Corresponding	765.00	1,000.00	240.00	500.00
Institutional Members	3,400.00	4,000.00	2,500.00	3,500.00
American Bibliography	—	4,500.00	11,478.85[3]	5,000.00
Dividends & Interest	7,010.57	7,000.00	7,459.67	7,000.00
Journal Sales	5,727.00	5,000.00	11,174.00	5,000.00
Reprints	3,842.90	4,800.00	3,244.90	3,600.00
Address Labels	—	—	844.22	—
Advertisements	572.14	1,500.00	623.00	600.00
Student Activities	462.00	225.00	250.00	250.00
Annual Meetings	611.07	900.00	3,833.15	700.00
Miscellaneous	1,305.03	300.00	2,900.64	3,000.00[5]
Profit (Sale of Securities)	21,997.38	—	—	—
Total	$143,013.05	$129,225.00	$141,829.02	$123,650.00
Expenses:				
Journal Printing	$ 40,599.99[1]	$ 66,000.00	$ 65,927.17	$ 72,000.00
Editorial Support	15,700.00	15,600.00	15,600.00	15,600.00
Printing Reprints	2,059.54	4,800.00	1,863.02	2,500.00
Address Labels	294.82	200.00	273.72	300.00
Purchase of *Journals*	658.53	1,500.00	2,283.76	1,500.00
Postage & Telephone	2,011.05	2,000.00	2,527.50	2,200.00
Office Supplies & Printing	430.45	2,000.00	2,099.37	2,000.00
Annual Meeting	1,991.94	2,500.00	1,305.14	2,500.00
Awards	3,700.00	4,000.00	3,068.00	800.00
Committees	1,232.19	3,000.00	1,244.46	2,000.00
Bonds	149.00	160.00	149.00	160.00
Student Activities	426.97	225.00	1,131.99	1,200.00
Sec-Treas. Assistance	10,020.65	12,000.00	12,266.96	14,500.00
Sec-Treas. Honorarium	3,000.00	4,000.00	4,000.00	4,000.00
American Bibliography	3,239.65	12,000.00	6,507.70	7,500.00
Interest Expense	631.51	—	—	—
IAEA Grant	—	—	—	5,000.00
Handbook-Directory	—	7,000.00	—	—
Miscellaneous	4,067.08[2]	1,900.00	834.81[4]	4,000.00[5]
Loss (Sale of Securities)	7,114.96	—	—	—
Total	$ 97,328.33	$138,885.00	$121,082.60	$137,760.00
Balance	$ 45,684.72	$—9,660.00	$ 20,746.42	$—14,110.00

[1] Actual cash outlay was $50,599.99 (see 1971 report).

[2] Includes $2,000 advance.

[3] Includes $5,000 from AID.

[4] Includes $14.13 for exchange charges and $567.50 for refunds.

[5] Includes $2,000 advance and/or repayment.

Table 3. Balance sheet, December 31, 1972, with comparisons

Item	1970	1971	1972
Assets:			
Cash-Bank	$ 32,048.68	$ 46,805.43	$ 63,540.82
Cash-Agency Act, U.K.	2,806.54	921.27	1,559.27
Cash Broker	897.76	7,338.59	14,788.27
Investments:			
Corp. Bonds (at cost)	22,936.91	—	—
(Approx. market value)	16,231.25	—	—
Stocks (at cost)	64,627.98	102,551.99	102,551.99
(Approx. market value)	154,465.75	194,777.25	214,096.75
Total Assets (at cost)	$123,317.87	$157,617.28	$182,440.35
Liabilities:			
Notes Payable	$ 7,784.43	$ —	$ —
Prepaid Membership Dues	29,080.50	35,173.35	22,192.00
Prepaid Am. Biblio Subs.	—	942.00	—
Accounts Payable	22,751.83	12,116.10	30,116.10
Net Worth	63,701.11	109,385.83	130,132.25
Total Liabilities	$123,317.87	$157,617.28	$182,440.35

On the expense side, we were able to print the *American Bibliography* for only $6,507.70 instead of the budgeted $12,000, thanks again in a large part to the University of Kentucky Printing Department.

As you can surmise, your Secretary-Treasurer does not like deficit spending. Every effort has been made to enhance the income by putting forth extra effort to collect dues, sell *Journals,* address lists, etc., and to hold down expenses by getting printing done for the cost of paper by my own university, by using unpaid family labor, etc. It is my opinion that these efforts have been well worthwhile to the AAEA during the period of uncertainty with respect to rising prices and the number of activities underwritten by the Association.

A word is in order about the Handbook-Directory. As you know, it finally came out in February-March 1973. A camera-ready copy was submitted to the printer on July 5, 1972, with all of the work being done by my office in 7½ months after the deadline for entries. The first quotation was around $29,000 for printing and mailing. By providing a camera-ready copy and effecting certain economies in the production process, with perhaps some sacrifice in quality, we were able to produce 13,000 copies for only $8,220.23. (For purpose of comparison 6,800 copies of the December 1972 issue of the *Journal* cost $16,805.20.) Your Secretary-Treasurer solicits comments on how to improve the usefulness of the Handbook-Directory and yet keep the cost in line when revised again.

The *American Bibliography of Agricultural Economics* will need perhaps some subsidy from the AAEA for some time to come. For 1972, we had about 200 members and approximately 400 libraries as subscribers. The Advisory Committee for *ABAE* is currently evaluating this activity.

As reported for 1971, the most pressing problems facing the AAEA continue to be inflation and the number of activities in which we are engaged that require money. Presently, we are still in good financial shape, but sooner or later we will need some "new tricks" to keep our head above water.

The 1972 Balance Sheet for the AAEA showed an increase net worth of $20,746.42 over 1971 (Table 3). The net worth is not large for an association of our size considering the number of activities underway. It does provide an adequate credit rating to enable the AAEA to transact business in a convenient way.

Your patience and cooperation during the year were appreciated. The year has been a pleasant one.

Respectfully submitted,
JOHN C. REDMAN
Secretary-Treasurer

AUDIT REPORT

Dear Dr. Castle:

The undersigned conducted the annual audit of the financial affairs of the AAEA on July 18, 1973. Records were inspected for the calendar year 1972.

As a part of our audit, we examined the income and expense accounts, inspected the checking account, confirmed the reported inventory of securities, and checked the financial balance sheet. Other aspects of the financial affairs of the association were reviewed, including the Secretary-Treasurer and Investment Committee reports to be presented at the August business meeting.

We found the financial records to be correct and, in our opinion, accurately reflect the financial position of the American Agricultural Economics Association as of December 31, 1972.

Respectfully submitted,
FRED E. JUSTUS JR.
JAMES E. CRISWELL

REPORT OF THE INVESTMENT COMMITTEE

The portfolio of investments by the AAEA did not change greatly during 1972. The only change was the addition of seven shares of Northern Illinois Gas at no cost because of a spinoff of the Iowa Illinois Gas corporate bond the AAEA sold in 1971. The AAEA does not own any corporate bonds. The stocks carried on the books at cost of $102,551.19 had a market value of $214,096.75 at the close of the business year, increasing by $19,321.50 over the previous year (Table 1). Our investments in stocks yielded $7,449.68 in dividends (Table 2).

Not counting Northern Illinois Gas, which came into the portfolio during the year, we had six stocks worth less and eight stocks worth more at the end of the year than at the beginning. Based on cost, a 7.27 percent return was realized.

Respectfully submitted,
JOHN C. REDMAN,
for the Investment Committee

Table 1. AAEA summary of investments, year ending December 31, 1972

Item	Income	Value	
	Jan. 1-Dec. 31, 1972	Cost	Market
Stocks:			
On hand, Jan. 1, 1972		$102,551.99	$194,775.25
On hand, Dec. 31, 1972		102,551.91	214,096.75
Dividends & Income	$7,459.67		

Table 2. AAEA stocks, December 31, 1972

Company*	No of Shares	Original Cost	Dividends Jan. 1-Dec. 31	Market Value	
				Dec. 31, 1971	Dec. 31, 1972
Am Cyanamid (A)	250	$ 9,143.43	$ 312.52	$ 8,500.00	$ 8,000.00
Am Tel & Tel (A+)	288	11,421.11	763.20	12,888.00	15,192.00
A T&T $4CV (AA)	300	16,934.00	1,200.00	17,775.00	18,300.00
Borden (A+)	228	2,162.41	273.60	6,298.50	7,182.00
Chase-Manhattan (A+)	93	1,115.09	186.00	5,382.375	5,208.00
Clark Equipment (A—)	600	2,200.67	870.00	28,125.00	32,550.00
Com. Edison (A+)	232	7,467.14	510.40	9,222.00	8,323.00
Cont. Can (A)	225	4,315.38	360.00	7,228.125	6,834.375
Exxon[1] (A+)	153	10,325.36	581.40	11,283.75	13,387.50
Goodyear (A)	500	16,692.50	442.00	15,937.50	15,750.00
Jewel (A)	100	3,875.94	163.00	6,300.00	5,412.50
Northern IL Gas (A)	7	—	13.32	—	193.375
Sears Roebuck (A+)	304	1,845.38	471.20	31,160.00	35,264.00
Std Oil, Ind (A)	400	7,356.68	956.80	27,800.00	35,000.00
Texaco (A+)	200	7,696.90	332.00	6,875.00	7,500.00
Rights[2]			24.23		
Total		$102,551.99	$7,459.67	$194,775.25	$214,096.75

* Standard & Poor ratings shown in parenthesis.

[1] Formerly Standard Oil of New Jersey.

[2] Rights for Com. Edison sold.

REPORT OF THE EDITOR

Over the past twelve months production of the *Journal* has been an exasperating and sometimes tumultuous experience for the editorial staff. While the manuscript evaluation and selection process has proceeded in a smooth and effective manner, problems and delays were encountered in the galley, printing, and distribution phases of the production and distribution process.

On the positive side the editors have, we feel, improved the overall quality of the *Journal* by increasing the use of young professionals as reviewers of manuscripts submitted for critical review. Also, sensitivity to the times has led to a fivefold increase in the number of women professionals used as reviewers. Other new developments include: a revitalized and restructured index in the December issue to portray more adequately the annual contents of the *Journal;* the solicitation of three papers for the August issue to discuss the timely and important food price problem in the United States and related public policy issues; the publication of articles covering a broad range in subject matter and varied philosophical and methodological bases. The 1973 volume of the *Journal* will, we believe, admirably represent the subject matter and societal contributions of the contemporary agricultural economist.

The level of new submissions over the past year was essentially identical with the 264 submissions received the previous year (Table 1). While the number of articles, short articles, and notes accepted for publication in 1973 was larger than in the previous two years, there was a decrease in 1973 of the number of communications accepted for publication (Table 2). The decrease in the publication rate of communications is largely a function of the number submitted, since there is a high acceptance rate for proposed communications. The overall acceptance rate of proposed papers submitted to the review process has tended to stabilize at slightly above one third in the past two years (Table 1).

In addition to the regular function of "editing" the *Journal*, the editorial committee has been actively seeking alternative methods of financing the *Journal* under the pressure of increased printing costs. As a method of offsetting prospective increases in printing costs, the editorial committee proposed at the Toronto meetings of the Executive Board that "a mandatory page charge of $15 per published page be imposed (with certain exceptions) upon the author's employer and/or granting agency for articles, short articles, notes, and communications" published in the *Journal*.

In early 1973 our printer sought a 14.8 percent increase in rates, effective with the November 1973 issue. The Secretary-Treasurer and Editor of the Association jointly evaluated alternative bids for the printing contract, including site visits of the two competing printing plants. On the basis of information developed from these investigations, the Executive Board of the Association has switched printers (after 46 years with the same printer) effective with the December 1973 issue and thereby avoided an increase in printing costs for the immediate future without any loss in quality of the product. The need for page charges has, thus, been postponed or delayed indefinitely; however, they probably cannot be avoided in the longer run if paper and printing costs increase as steadily in the future as in the recent past.

In view of the unprecedented delays in the delivery of certain issues of the *Journal* in 1972 and 1973, our members and subscribers are due an apology. The Gainesville editorial staff is working diligently to place production of the *Journal* back on an orderly schedule. The initial delay occurred with the November 1972 issue. Part I of this issue was completed approximately on schedule, but delivery was held up to await completion of Part II—the Handbook Directory. The Secretary-Treasurer's office submitted camera-ready copy to the printer for the Handbook-Directory in July of 1972, but delivery of the final product did not occur until late January 1973. The December 1972 issue encountered delays at the printers during the Christmas period. The tardiness of the November and December 1972 issues in turn derailed the production schedules for the February and May 1973 issues. Our effort to shorten the delay for the May 1973 issue to two months was frustrated by an apparent loss in the mails of essentially the entire May 1973 issue of corrected galleys! The August 1973 issue is only about one week behind schedule, and the November 1973 issue is booked and hopefully on schedule. Thus, initial delays at the printer jumbled production schedules in Gainesville, Florida, and Menasha, Wisconsin; and a loss of critical materials in the mails explain, but perhaps do not excuse, some of the other

Table 1. **New AJAE submissions, manuscripts accepted and the acceptance rate, 1960/61—1972/73**

Period	Number of New Submissions[a]	Number of Manuscripts Accepted for Publication	Manuscripts Accepted as a Percent of New Submissions
1960/61	140[b]	70[b]	50[b]
1961/62	140[b]	70[b]	50[b]
1962/63	167	77	46
1963/64	162	77	48
1964/65	184	80	43
1965/66	218	87	40
1966/67	195	96	49
1967/68	212	100	47
1968/69	268	105[b]	39[b]
1969/70	249	95[b]	38
1970/71	250	96[b]	38
1971/72	264	96	36
1972/73	263	90	34

[a] Excludes proceedings papers and book reviews.

[b] Estimated.

Table 2. Number of AJAE articles, notes, and communications published excluding proceeding papers and book reviews, 1971, 1972, and 1973

	1971		1972		1973	
Articles	41		30		22	
Research Notes	23		—		—	
Short Articles/Notes	—		37		49	
Subtotal		64		67		71
Communications	*32*		*29*		*19*	
TOTAL		96		96		90

delays. For the balance of our tenure as editor we will strive for a normal delivery schedule.

Returning to the bright side, the Editor is grateful to the many persons who contributed generously of their time and talent. Max R. Langham, the Associate Editor, deserves more than the usual commendation for his yeoman services to the *Journal*. Marcia Heighton replaced Carole Oglesby as Editorial Assistant at a difficult time and offered capable services in this demanding position. The secretarial services of Cindy Bass early in the year and now Dorothy Vieira have been first rate. Peter G. Helmberger, our Book Review Editor, has carried out his responsibilities in a very efficient and effective manner. In addition to their extensive manuscript evaluation function, members of the Editorial Council also advised the Gainesville editorial staff regarding various editorial policies and read, evaluated, and ranked their choices for the Outstanding *Journal* Article for 1972. Members of the 1972 Editorial Council were: Ludwig Auer, Michael Brewer, John P. Doll, Clark Edwards, Vernon R. Eidman, Lehman B. Fletcher, Yujiro Hayami, Bruce F. Johnston, Marvin W. Kottke, Arthur B. Mackie, William E. Martin, Daniel I. Padberg, Roy G. Stout, Takashi Takayama, Henry A. Wadsworth, and Francis E. Walker. Finally, the editors are genuinely grateful to the more than 280 other professionals who reviewed *AJAE* submissions anonymously and provided an essential basis for editorial decisions regarding publication. As a meager token of our appreciation for their efforts, these reviewers for the 1973 Volume are revealed in Table 3. (The list is *not* exhaustive; it does not include the "countless" colleagues of our designated reviewers who also provided evaluative comments indirectly.)

LEO POLOPOLUS,
Editor

Table 3. AJAE reviewers, Volume 55

Reviewer	Reviewer	Reviewer	Reviewer
Dale W Adams	Daniel W. Bromley	H. E. Doran	Roger W. Gray
John W. Adams	William G. Brown	Peter P. Dorner	Herbert W. Grubb
W. H. Alexander	W. Keith Bryant	Kenneth W. Easter	Thomas F. Hady
Christopher O. Andrew	J. B. Bullock	Bobby R. Eddleman	H. G. Halcrow
David L. Armstrong	Oscar R. Burt	W. F. Edwards	Albert N. Halter
Jack Armstrong	Wilfred V. Candler	Carl K. Eicher	David E. Hansen
Henry B. Arthur	Hoy F. Carman	D. A. Eiler	Claude C. Haren
Harry W. Ayer	Daryl Carlson	J. G. Elterich	Virden L. Harrison
Emerson M. Babb	Gerald A. Carlson	Robert D. Emerson	James B. Hassler
William B. Back	Harold O. Carter	Donald J. Epp	Dale E. Hathaway
Daniel D. Badger	R. W. Cartwright	Bernard L. Erven	Joseph Havlicek Jr.
C. B. Baker	P. A. Cassidy	Walter P. Falcon	Marvin L. Hayenga
Raleigh Barlowe	Emery N. Castle	L. S. Fan	Earl O. Heady
Peter J. Barry	Duane Chapman	J. Edwin Faris	R. G. Heifner
Larry L. Bauer	Joyce Chen	Kenneth R. Farrell	John D. Helmberger
Bruce Beattie	Wen-Shyong Chern	Paul L. Farris	Dennis R. Henderson
Frederick W. Bell	Chauncey T. K. Ching	Lyle P. Fettig	Robert W. Herdt
Thomas M. Bell	C. J. Cicchetti	Lonnie Fielder	William M. Herr
Fred J. Benson	Willard W. Cochrane	Barry L. Flinchbaugh	Thomas A. Hieronymus
C. R. Berry	Dale K. Colyer	Richard J. Foote	Ronald J. Hildreth
Arlo W. Biere	J. Richard Conner	John R. Franzmann	Hans G. Hirsch
J. H. Bieri	Hugh L. Cook	A. L. Frederick	James C. Hite
Leo V. Blakeley	Ronald Cummings	Ben C. French	Irving J. Hoch
R. N. Boisvert	Wayne C. Curtis	R. J. Freund	David Holland
James T. Bonnen	Dana G. Dalrymple	Varden Fuller	John Holt
Robert F. Boxley	Rex F. Daly	Wayne A. Fuller	Paul J. Hooker
Wayne E. Boyet	Ray Daniel	Bruce D. Gardner	Sidney S. Hoos
John R. Brake	Rachel Dardis	P. S. George	Dale Hoover
Harold F. Breimyer	Ralph C. d'Arge	Marshall Godwin	Ira Horowitz
George Brinkman	John C. Day	Ray A. Goldberg	J. P. Houck
Dagobert L. Brito	J. Delphendahl	Darrel Good	Yukon Huang
E. E. Broadbent	Gerald A. Doeksen	J. Richard Grant	James F. Hudson

Table 3. AJAE reviewers, Volume 55—Continued

Reviewer

Harlan Hughes
Verner G. Hurt
Leroy J. Hushak
John E. Ikerd
J. J. Jacobs
Peter Jacobs
Robert E. Jacobson
J. Dean Jansma
Alain de Janvry
Mark Jelavich
Edward V. Jesse
Stanley R. Johnson
Richard S. Johnston
George G. Judge
Richard E. Just
P. L. Kelley
E. D. Kellogg
Maurice Kelso
Waldon R. Kerns
Werner Kiene
Richard A. King
Yoav Kislev
Allen Kneese
Jack L. Knetsch
Ron Knutson
Kenneth R. Krause
Raymond Krofta
S. N. Kulshreshtha
Ronald D. Lacewell
George W. Ladd
Larry N. Langemeier
Arnold B. Larson
Lawrence J. Lau
T. C. Lee
Bernard Lester
R. M. Leuthold
E. Phillip LeVeen
Donald R. Levi
Gregg Lewis

Reviewer

Theodore P. Lianos
Edna Loehman
Samuel H. Logan
Paul W. Lytle
Francis P. McCamley
R. J. McConnen
John G. McNeely
W. K. McPherson
W. W. McPherson
J. Patrick Madden
Lester V. Manderscheid
Jitendar S. Mann
R. J. Marasco
Lee R. Martin
Yoshihiro Maruyama
Gene A. Mathia
Masao Matsumoto
Elmer Menzie
Galen C. Moses
Arthur T. Mosher
T. D. Mount
Allen G. Mueller
W. F. Mueller
Lester H. Myers
Fred Nelson
Paul E. Nelson
J. M. Nielson
Albert J. Nyberg
Frank Orazem
Andreas Papandreou
Quirino Paris
Edith H. Parker
David W. Parvin Jr.
E. C. Pasour Jr.
Allen B. Paul
George Perkins
R. K. Perrin
Willis L. Peterson
David C. Petritz

Reviewer

Anthony A. Prato
Don D. Pretzer
Frederick J. Prochaska
J. C. Purcell
Ronald E. Raikes
Alan Randall
Phillip M. Raup
Gordon Rausser
Daryl Ray
Martin T. Redfern
Franklin J. Reiss
Schlomo Reutlinger
John E. Reynolds
Harold M. Riley
Keith D. Rogers
J. R. Roush
E. Paul Roy
Vernon W. Ruttan
Ezra Sadan
W. Neill Schaller
A. Allan Schmid
Andrew Schmitz
Kenneth C. Schneeberger
Lee F Schrader
Ronald A. Schrimper
Wayne A. Schutjer
John T. Scott
James A. Seagraves
David W. Seckler
W. D. Seitz
J. D. Sengupta
James D. Schaffer
J. Herbert Snyder
Vernon Sorenson
Stephen H. Sosnick
H. H. Stoevener
John Stollsteimer
T. T. Stout
J. R. Strain

Reviewer

P. A. V. B. Swamy
Earl R. Swanson
Jeannine Swift
Reed D. Taylor
K. R. Tefertiller
W. C. Thiesenhusen
Michael Thomas
George Tolley
William G. Tomek
Harry C. Trelogan
Michael Turner
Luther G. Tweeten
Fred H. Tyner
Edward W. Tyrchniewicz
Samuel G. Unger
M. Louis Upchurch
Alberto Valdes
John J. Waelti
John E. Waldrop
O. L. Walker
T. Dudley Wallace
Richard B. Walsh
Ronald W. Ward
Joseph Weiss
Finis R. Welch
J. G. West
Fred C. White
Fred H. Weigmann
Willard Williams
Ian R. Wills
Larry J. Wipf
Ronald A. Wykstra
Mark Yang
Dan Yaron
Pan A. Yotopoulos
James G. Youde
R. A. Young
Robert Zellner
Pinhas Zusman

AWARD WINNERS

DISTINGUISHED EXTENSION PROGRAM

CHARLES W. COALE JR. and DON L. LONG, *Marine Economics Workshop*, Virginia Polytechnic Institute and State University.

DISTINGUISHED EXTENSION PUBLICATION

HAROLD D. GUITHER, University of Illinois, *Who Will Control U. S. Agriculture?*, North Central Regional Publication 32, Cooperative Extension Service, College of Agriculture, University of Illinois, Urbana-Champaign, Illinois, August 1972.

DISTINGUISHED UNDERGRADUATE TEACHING AWARDS

Less than 10 years:

WAYNE D. PURCELL, associate professor, Oklahoma State University, *Agricultural Marketing.*

10 or more years:

JOHN B. SJO, professor, Kansas State University, *Farm Management and Production Economics.*

UNPUBLISHED RESEARCH AWARDS

Doctoral Theses

JOHN W. FREEBAIRN, *Some Adaptive Control Models for the Analysis of Economic Policy: United States Beef Trade Policy*, University of California, Davis; advisor: Gordon C. Rausser.

DARRELL GOOD, *Potential Impact of Environmental Pollution Abatement Alternatives on the Michigan Dairy Farming Industry*, Michigan State University; advisor: Larry Connor.

Tied for Third:

HAROLD S. BEEBOUT, *The Production Surface for Academic Achievement: An Economic Study of Malaysian Secondary Schools*, University of Wisconsin; advisor: Rueben C. Buse.

Gustavo A. Nores, *Structure of the Argentine Beef Cattle Economy: A Short Run Model, 1960–1970,* Purdue University; advisor: Joseph Havlicek Jr.

Masters Theses

Daniel Leonard, *Some Economic Aspects of Reclaiming Strip-Mined Land with Digested Sludge,* University of Illinois; advisor: Wesley Seitz.

Marshall A. Martin, *The Income Distribution Impacts of the Adoption of Mechanical Harvesting of Cotton in the United States,* Purdue University; advisors: Joseph Havlicek Jr. and Tom C. Kerr.

Thomas A. Stucker Jr., *Effects of Payment Limitations Applied to the Feed Grain Programs in the North Central States,* Purdue University; advisor: Bob Jones.

PUBLISHED RESEARCH AWARDS

Blake Imel, Michael R. Behr, and Peter G. Helmberger, *Market Structure and Performance,* D. C. Heath and Company, Lexington, Massachusetts, 1972.

Herbert Stoevener, Joe Stevens, Howard Horton, Adam Sokoloski, Loys Parrish, and Emery Castle, *Multi-Disciplinary Study of Water Quality Relationships: A Case of Yaquina Bay, Oregon,* Agricultural Experiment Station Oregon State University, Corvallis, Oregon, 1972.

Tied for Third:

J. Patrick Madden and Marion D. Yoder, *Program Evaluation: Food Stamps and Commodity Distribution in Rural Areas of Central Pennsylvania,* Department of Agricultural Economics and Rural Sociology, Bulletin 780, University Park, Pennsylvania, June 1972.

Earl O. Heady, Howard C. Madsen, Kenneth J. Nicol, and Stanley H. Hargrove, *Agricultural and Water Policies and the Environment,* Center for Agricultural and Rural Development Report 40T, Iowa State University, Ames, Iowa, June 1972.

OUTSTANDING ARTICLE IN AJAE

Alan Randall, New Mexico State University, "Market Solutions to Externality Problems: Theory and Practice," *Am. J. Agr. Econ.* 54:175–183, May 1972.

REPORT OF THE COMMITTEE ON ECONOMIC STATISTICS AND THE ASA-AAEA COMMITTEE ON AGRICULTURAL STATISTICS

Economic Statistics Committee

Much of the Economic Statistics Committee activity is now taking place in the context of its two primary task forces, both of which are quite active. The Food and Fiber Statistics Task Force under the chairmanship of Jim Hildreth met in November 1972 to develop recommendations for changes in the 1974 Census of Agriculture. M. L. Upchurch of the University of Florida was asked at this meeting to develop a position paper laying out an overall road map for the work of the Task Force. The Task Force met to discuss his paper at the August 1973 AAEA meetings in Edmonton. As a first step, a Task Force conference is being planned jointly with ERS and SRS and involving the Bureau of Census and the Office of Management and Budget and devoted to an examination of various proposed new treatments of food and fiber statistics. The conference is scheduled for early fall of 1972. Membership of the Task Force on Food and Fiber Statistics includes: R. J. Hildreth (Chairman), George E. Brandow, Harold Breimyer, Paul L. Farris, Dean E. McKee, P. I. Padberg, Mark Powers, Robert Reierson, Harry Trelogan, M. L. Upchurch, Eldon E. Weeks, and James T. Bonnen (ex officio).

The Task Force on Social and Economic Statistics for Rural Areas chaired by George Tolley has been very busy. The Task Force met in Washington, D. C., in December 1972 to plan its activities for the year and agreed to draft a series of papers on various substantive areas of data all addressed to the question: what are the data needs and problems? The Task Force met again in June 1973 to seminar these papers and to review with representatives of several relevant federal agencies their current situation and problems as the producers (and in some cases users) of these data. The meeting concluded by agreeing to draft a series of papers on the question: what should be done about these problems? This issue will be the focus of a conference scheduled for November 1–2, 1973, in Chicago. The Task Force itself was constituted around specifically identified areas of data or data utilization and individual members of the Task Force are taking responsibility for preparation of the papers. Membership of the Task Force on Social and Economic Statistics includes: George S. Tolley (Chairman), J. Patrick Madden, Ray D. Vlasin, Mancur Olson, Edgar S. Dunn Jr., Lynn M. Daft, Clark Edwards, Bruce Gardner, Lee Bawden, James T. Bonnen (ex officio), and W. Keith Bryant.

The AAEA Economic Statistics Committee met in November 1972 to review what had been learned from reactions to our August 1972 Gainesville seminar session paper which we viewed as a progress report to the Association. In addition, we seminared the question of the nature of data systems with Ed Dunn of Resources for the Future, Inc. The progress report of the Committee presented in the seminar session at Gainesville (and printed in the December 1972 *AJAE*) appears to have made a substantial impression on Washington statisticians. Copies circulated widely and it was republished in the *Statistical Reporter,* a periodical concerned with federal statistics. At its November 1972 meeting, the Committee also considered recommendations on the 1974 Census of Agriculture received from its Task Force on Food and Fiber Statistics. The Economic Statistics Committee transmitted to the Secretaries of Agriculture and of Commerce the following set of recommendations:

> The Economic Statistics Committee of the American Agricultural Economics Association at its meeting of November 16, 1972 approved several recommendations concerning the Census of Agriculture and the Census of Population. These recommendations represent the considered professional judgment of the economists and statisticians who serve on the Economic Statistics Committee and its Task Force on Food and Fiber Statistics. While recognizing that factors beyond the purview of professional judgments may enter into governmental decisions on such matters, we strongly propose the following recommendations:
>
> A. The Census of Agriculture should be modified to:
>   1. enumerate all farms of Value of Sales $2500 and up;
>   2. sample the farms of under $2500 Value of Sales. Information should be obtained on these smaller farms regarding their various sources and amounts of income along with additional information regarding agricultural production.
>
> B. The unit of observation in the Census of Agriculture should be an *establishment* in the same sense that *establishment* is used in Censuses of Manufacture and Business; with the implication that 1) items of income, such as from recreation and custom work for others, be included as receipts, 2) that information on ownership control be obtained, and 3) that an *establishment* engaged to a significant extent in nonagricultural business, will have the nature of other operations identified.
>
> C. The Census of Population and current population surveys should be expanded and modified to fill the increasingly critical need for more articulated and frequent information on people, their incomes and social and economic activities in rural as well as urban areas.
>
> D. The Census of Agriculture should be taken in 1974 with prompt reporting of data.
>
> E. Because Census of Agriculture appears to have a low priority in the Department of Commerce as evidenced by late reporting and because of advantages of coordinating the Census of Agriculture with current statistical programs in the USDA, the functions of the Census of Agriculture should be transferred to the Department of Agriculture.

The last two recommendations are the consequence of learning during our November meetings that the administration had decided not to take the 1974 Census of Agriculture. The Chairman of the Economic Statistics Committee closely followed the subsequent conflict over whether the 1974 Census would indeed be taken as required by law. This included participation in a rather stormy February 1973 meeting of the Census Advisory Committee which Commerce had failed to consult with or inform of its intentions. The Chairman also testified on this issue before both the Senate and House Post Office and Civil Service Committees in May and June 1973. It now appears that the 1974 Census of Agriculture will be taken, although without any conceptual improvements over the 1969 Census.

The Economic Statistics Committee is working to get a program on agricultural data problems scheduled for one of the future meetings of the American Statistics Association. We have also had some communications with the National Academy of Science Committee on National Statistics chaired by William Kruskal of the University of Chicago. We hope soon to have an opportunity to discuss with them the AAEA Economic Statistics Committee's concerns about national statistics. In the past year far closer relations have developed with the American Statistics Association and its new Executive Director, Fred Leone.

Joint ASA-AAEA Committee on Agricultural Statistics

The Joint ASA-AAEA Committee on Agricultural Statistics met in June 1973. This Committee, which is advisory to the Census and to the USDA on agricultural statistics, was brought up to date on and discussed a series of issues including: (1) the proposed revision in farm definition and classification, (2) the status of the 1974 Census of Agriculture and possible alternatives if it is not taken, (3) the status of plans for a farm directory as well as (4) the review of a number of recent developments in SRS programs and procedures. Both Don Paarlberg, USDA Director of Agricultural Economics, and Vincent Barabba, the new Director of the Bureau of the Census, participated.

AAEA and the Federal Statistics Users Conference

Finally, I should like to urge AAEA affiliation with the Federal Statistics Users Conference (FSUC). John Aiken, Executive Director of FSUC has written the Association's officers urging our affiliation and providing descriptive material on the role and services of FSUC. The FSUC, as its title suggests, is an association of various users of federal statistics. The membership is predominately industrial but includes a number of food and fiber industry firms as well as the American Economic Association, the American Marketing Association, the American Sociological Association, other professional groups, and several universities. The FSUC has become a forum within which the changing problems and needs of various federal statistics users are shared with those agencies who produce the numbers. FSUC does a good job of reporting events of importance to statistics users. The advantages to the AAEA of affiliation would include: (1) providing access to a considerable flow of information and thus being better informed on statistical matters of primary professional import, (2) providing a vehicle for communicating with Congress and the various statistical agencies concerning the problems that arise, and (3) perhaps most importantly, providing an opportunity to begin to create a presence in Washington among the various groups that affect the data base upon which our profession depends. Increasingly, these groups are not just our associates in the Land Grant system and in the food and fiber industry. Leadership is needed in this area and the AAEA has an obligation to play its role. There will of necessity be many changes in national statistics over the next decade. We must participate in the process or see our data base transformed in ways injurious to the needs of the people we serve as a profession.

Respectfully submitted,
James T. Bonnen,
Chairman

REPORT OF THE EDUCATION COMMITTEE

The major activity conducted by the Committee was the workshop on improvement of education in agricultural economics. The workshop program followed the 1972 annual meetings. Since the workshop had been planned prior to last year's meeting, the last annual report of the Committee contains the program content.

Ninety-one participants registered and paid the $25.00 fee for the workshop. Speakers who were at one workshop for only one day and all undergraduates were not registered at a fee, thus the total number of participants was near 100 with 6 undergraduate students, 16 federal government employees, 10 industry employees and the balance from a large number of academic institutions. The participation rate among non-Land Grant institutions was low, probably because of the severely limited travel budgets mentioned by several nonparticipating institutions.

A brief financial report follows:

Receipts (91) registrants @ $25.00 each		$2,275.00
Expenses:		
Consultant—Kropp	$300.00	
Expenses—Kropp	77.69	
Expenses—U. of Minn.	174.55	
Expenses—Boddy	210.00	
Meeting rooms	100.00	
Telephone (392-2336)	27.47	
Paper supplies and copying	46.50	
Coffee	39.00	
Total expenses	=	975.21
Balance		$1,299.79

The Association had agreed to fund publication of the proceedings in the *Journal*. The $1,299.79 balance will reduce the commitment of regular Association resources to publication of the workshop proceedings.

Workshop participants were generally enthusiastic about the experience. Their main concern was the limited number who can directly benefit and they unanimously agreed on the need for more activities of this type sponsored by the Association. The major criticisms of the workshop were the limited time for free and open discussion and the tiredness of the participants when the workshop follows the annual meetings of the Association. A number of positive suggestions for Association activities were forthcoming—e.g., integrate instructional materials into the *Journal* and annual meetings, support development of improved instructional materials, catalog and advertise teaching materials available at various institutions, support regional workshops, etc. One student summarized his view this way, "You guys will be evaluating to eternity—practice what you preach—change and improve!" But the general reaction of all, including students, was positive. If future workshops are sponsored, it might be well to involve some graduate students even though the selection process may be difficult.

The workshop proceedings are being published as a supplement to the *Journal*. Fred Mangum has served as editor.

In line with the Board's decision of August 1971, the Committee conducted a survey of curricula in Agricultural Economics. Eldon Weeks accepted the responsibility for conducting the survey and distributed the questionnaire in late July 1972. He is still at work on the analysis of the returns. A final report will be distributed using funds that the Board approved at the December meeting.

The Committee has strengthened its ties with the Industry Committee through the workshop activity. Both Committees would recommend that a session on business internships be developed for the 1974 annual meetings.

The Education Committee activities for the coming year should include:

1. Advising on the content of sessions on teaching and education in the annual meeting program.
2. Urging the explicit encouragement of contributed papers in the teaching area for the annual meeting.
3. Encouraging further attention to education topics in the *Journal* by stimulating preparation of papers worthy of publication and support for the editor in efforts to increase publication of announcements related to education.
4. Monitoring emerging trends and problems in the area of education. In particular, a beginning might be made on a regular survey of placement of agricultural economics graduates by type of employment. Such information on a national basis would be useful in understanding a changing labor market as one input into curricular decisions.
5. Investigating the feasibility of regional organizations to stimulate better teaching. Regional

committees could organize workshops of other activities attuned to the needs of the area. Regionalization would also reduce the costs of travel and increase the number of educators that could be reached.

After these recommendations had been formulated, the Committee reviewed the report of the Special Committee on Student Activities. The Education Committee supports the recommendations of the Special Committee except that we respectfully suggest the title Education Committee rather than Resident Instruction Committee. The Education Committee fully supports the concept of an integrated, teacher-oriented approach by the Association to the improvement of undergraduate and graduate education.

Committee members as of August 1, 1973, are: Timothy M. Hammonds, Oregon State University; John Helmberger, University of Minnesota; Fred A. Mangum, North Carolina State University; Paul Kelley, Kansas State University; John McNeely Jr., Texas A & M University; John Rogalla, California Polytechnic; and Eldon E. Weeks, Economic Research Service, USDA.

Respectfully submitted,
Lester V. Manderscheid,
Chairman

REPORT OF THE EXTENSION AFFAIRS COMMITTEE

The Extension Affairs Committee of the American Agricultural Economics Association met twice during the last year, first during the AAEA Annual Meetings in Gainesville and second in Washington, D. C., January 29–30, 1973.

The Committee evaluated comments received from the Executive Board on its 1971–72 annual report. As a result of encouragement received, the Committee undertook a survey of promotion criteria for extension economists in the United States. A survey form was prepared and sent to Department Heads or Extension Administrators in all states. Responses are currently being summarized.

The second activity of the Committee involved organizing a seminar session on extension for the August 1973 joint meetings of AAEA, CAES, WAEA in Edmonton. After discussion in the Committee, and with our Canadian colleagues, arrangements were made for the presentation of Seminar Session 4.0, "Responding to an Expanding Clientele."

Current members of the committee are:

	Term Expires
H. A Wadsworth	1973
John S. Bottum	1973
W. Neill Schaller	1973
Kenneth D. Duft	1974
William M. Carroll	1975
George L. Casler	1975

Over the past three years, Presidents of the Association have tried to structure the Committee so that only two members were replaced each year. This goal should be attained this year. It is suggested that President-Elect Tefertiller appoint two members for three-year terms and one member for a one-year term to accomplish this. He may want to ask one of the retiring members to extend his commitment one year or appoint a new person for one year, anticipating reappointment for a full three-year term.

Pending completion of the survey, no further plans for activities in 1973–74 have been made.

Respectfully submitted,
H. A. Wadsworth,
Chairman

REPORT OF THE INTERNATIONAL COMMITTEE

Committee members in cooperation with others of the Association with similar interests have pursued several different efforts during the past year. The Committee, through meetings and other forms of communication, has facilitated these efforts but the work has been heavily dependent on individual interest and initiative.

Several activities were initiated. They have included:

1. Identification of universities in other countries which may be appropriate locations for work by American students. Plans call for use of materials already compiled by some members of the Association, sending of a questionnaire to selected universities, and compilation and circulation of information obtained. Hopefully, this can be completed by the summer of 1974.
2. Development of lists of agricultural economics associations in other countries to foster improved interchange among the associations. Some lists are available; others are to be developed during the fall of 1973.
3. Further exploration of the potential role, financing, and participation in a small grants program to facilitate research of members of the Association, especially thesis advisers and scholars without substantial contacts with developing countries and related financing agencies.
4. Consultation with the staff of the Research Training Network (RTN) of the Agricultural Development Council regarding their program. The objectives of these relationships are to foster interest by the membership of the Association in this effort and to help assure the effectiveness of the programs by offering suggestions for improvement and reacting to preliminary proposals for changes and modifications.
5. Formulation and presentation of a proposal

to the Association that the Association sponsor a review of U. S. training and related research activities in the field of the economics of agriculture of developing countries. The proposal was presented to the Executive Board meeting at the August 1973 meetings. The proposal calls for the conduct of the review during the 1973–74 year. A report of the findings of the review would be anticipated at the 1974 summer meetings of the Association. The Committee proposed that the review be organized around a series of papers laying out the primary issues and a number of seminars patterned after the seminars of the Research Training Network of the Agricultural Development Council.

Respectfully submitted,
LYLE P. SCHERTZ,
Chairman

REPORTS OF THE COMMITTEE ON GRANTS TO THE INTERNATIONAL CONFERENCE OF AGRICULTURAL ECONOMISTS

The American Agricultural Economics Association in 1972 voted to make available $5,000 to be granted to participants in the International Conference of Agricultural Economists, held in Sao Paulo, Brazil, in August of 1973. It was understood that the Fund for the International Conference of Agricultural Economists would obtain an equal amount from other sources for the support of additional economists.

Nominations for the grants were received and evaluated by a committee composed of:

Vernon Ruttan
Lyle Schertz
Joseph Ackerman
R. J. Hildreth

Grants for U. S. economists totaled $9,700. The Fund for ICAE expended $5,150 and $4,550 of the Association funds were used. Grants for recipients in the western region were $500 and $450 for recipients from other regions, in recognition of travel costs.

One recipient found he was unable to use his grant the week before the conference. An attempt was made to transfer the grant to the next alternate on the list, but the alternate found it impossible to make the necessary arrangements. Thus $450 has been returned to the Association.

Approximately 820 agricultural economists participated in the conference in Sao Paulo. The conference was stimulating and useful to the participants. The Fund for the International Conference of Agricultural Economists wishes to express its sincere appreciation to the Association for the support of younger economists from the U. S. to the conference.

R. J. HILDRETH

REPORT OF THE STUDENT AFFAIRS COMMITTEE

The principal activity of the Student Affairs Committee during 1972–73 was assisting the student section in its program and contests.

In the debate contest, the topic for debate was: Resolved, that the consumer should pay the cost of agricultural pollution control through the market price system.

The winners of the debate contest were:
First: Robert Schmisseur and Mercer Turner, University of Illinois; Lyle Fettig and Donald Smith, coaches
Second: Jay Townsend and Tom Carson, Purdue University; Henry Courtney, coach
Honorable Mention: Roger Johnson and Steven Bolme, North Dakota State University; James Ubbelohde, coach

The winners of the speech contest were:
First: Murray Edwards, Texas A & M University
Second: Andrew Ashburn, Texas Tech University
Third: Brad Gungoll, Oklahoma State University
Honorable Mention: Carol Kiner, University of Illinois
Honorable Mention: Robert Craig, Michigan State University

The winners of the essay contest were:
First: Dick Wedin, Oregon State University
Second: Al S. Brogan, Montana State University
Third: Dale Minnick, Oklahoma State University
Honorable Mention: Richard G. Hollis, Texas Tech University
Honorable Mention: Mike Wischkaemper, Texas Tech University

The student section officers for 1973–74 are:
President: Brad Gungoll, Oklahoma State University
Vice-President: Barham Fuller, Texas A & M University
Secretary-Treasurer: Jay Townsend, Purdue University
Editor: Al Brogan, Montana State University
Directors: Dick Hudgins, Texas A & M University; Roger Johnson, North Dakota State University; Francisco Rolandi, University of Georgia; Melvin Toellner, University of Missouri; Mercer Turner, University of Illinois; Robert Usry, North Carolina State University

Respectfully submitted,
DONALD J. EPP,
Chairman

REPORT OF THE TELLERS COMMITTEE

Ballots received from the Secretary-Treasurer were counted by the Tellers Committee in the manner prescribed by the by-laws to preserve the secrecy of the ballots. James Nielson received a majority of the votes cast for President-Elect. Howard F. Robinson and Glenn E. Heitz received a majority of the votes cast for Director in their respective categories.

A. FRANK BORDEAUX JR.
BRUCE R. BEATTIE

REPORT OF VISITING LECTURER COMMITTEE

The program is limited to those universities offering an undergraduate or master's degree, but not a Ph.D. degree. Association funds are not available for the program and the schools have few funds available to support the program. Attempts are made to match the desire for a particular individual to give a lecture and the availability of that person to travel to the college or university.

A total of five institutions indicated a desire for visiting lecturers. When requests for specific individuals were made, the Committee contacted the individuals. Our records show that the following universities were provided with lecturers:

Universities	Lecturers
North Carolina Agricultural and Technical State University	Emery Castle, Oregon State University
Middle Tennessee State University	Robert M. Frederick, National Grange

Assuming the Board wishes to continue the program, the Committee requests the Board and members of the Association to contact eligible colleges and universities to make requests for visiting lecturers under the auspices of the program. The Committee will recontact the institutions requesting lecturers as in past years and set in motion the processes of the program for next year but would be very happy to receive additional requests.

It appears the Association owes a deep debt of gratitude to those lecturers who went to considerable personal difficulty to give lectures.

EMIL OWENS
JOHN THOMPSON
ANDREW VANVIG
R. J. HILDRETH, *Chairman*

MINUTES OF THE EXECUTIVE BOARD MEETING

Toronto, Ontario, December 28, 1972

The meeting was called to order by President Emery Castle at 9:00 a.m.

Present:

Voting members: Castle, Day, Baker, Farrell, Sundquist, McKee, Tefertiller, Ruttan

Members ex officio: Redman, Polopolus, Gamble, Brown

Guests: Stanton, Hathaway, Manning

1. Minutes of the Summer Meeting of the Executive Board at Gainesville, August 19–23, 1972, were approved as distributed.
2. McKee moved to amend the minutes to allow each representative (up to three) of an institutional member a vote in the affairs of the association. Seconded. Passed.
3. Baker reported as chairman of the Special Committee to evaluate the awards program. After considerable discussion, possible decisions were deferred to another time.
4. Hathaway reported for the Special Employment Committee, giving an account of the problems concerning the employment of professionals and presented a proposal for a grant from the U. S. Department of Labor, Manpower Division.
   Ruttan moved that the AAEA indicate its willingness to enter into a grant agreement with the U. S. Department of Labor to conduct a project to develop and evaluate an experimental full time employment service for agricultural economists. Seconded. Passed.
5. McKee moved that Loys Mather be designated as project leader for the AAEA employment study and be authorized to draft the final proposal for the signature of the President of AAEA. Seconded. Passed.
6. During the employment study, Baker was designated to represent the Board in an advisory capacity and Redman was designated to act on behalf of AAEA with respect to financial aspects.
7. Sundquist moved that AAEA express its appreciation to Loys Mather and Dale Hathaway and to the Department of Labor for their effort in developing the proposal for a grant. Seconded. Passed.
8. Castle announced the appointment of the membership on two special committees: Student Affairs Evaluation Committee and the *American Journal of Agricultural Economics* Evaluation Committee.
9. Polopolus reported for the Editorial Board on the page charge study. No action was taken.
   Day moved that in lieu of polling the membership on choice of page charge or dues increase the President be authorized to discuss the financial problems in a newsletter and authorize the President to conduct a poll as to the alternatives of financing the services and programs of the AAEA and/or conduct a discussion at the annual meeting. Seconded. Passed.
10. Polopolus submitted a report on possibility of a full disclosure policy for authors of articles accepted for publication in *AJAE*. Comments on the possibility should be sent directly to Polopolus.

Meeting recessed at 2:15 p.m. and reconvened on December 29, 1972, at 10:20 a.m.

Present:

Voting members: Castle, Day, Baker, Sundquist, McKee, Tefertiller, Ruttan, Farrell

Members ex officio: Redman, Gamble, Brown, Polopolus
Guests: Manderscheid, Martin, Manning

11. Gamble reported on activities of the Northeast Agricultural Economics Council, commenting on industry relations. McKee commented further on the problems of AAEA in serving industry.
12. Castle read the report for the chairman of the International Committee.
13. Discussions on suggested changes in the Awards Program were resumed.
Ruttan moved that the report of the committee be accepted and the changes be transferred to the present Awards Committee to be implemented by incorporating in the forthcoming announcement. The announcement in draft form is to be received by the Executive Board at Edmonton. Seconded. Passed.
14. Castle reported that the AAEA was invited to submit a nominee for the Browning Award which is selected by American Society of Agronomy for outstanding contribution. Farrell moved that a committee composed of the Chairman of the Awards Committee (chairman), a board member, and the Chairman of the Fellows Selection Committee be assigned the responsibility of selecting and presenting a person for the award. Seconded. Passed.
15. Manderschied reported on the Education Workshop held in August 1972. Results of evaluation indicate the workshop was highly successful.
Day moved that the Education Committee be authorized to spend up to $100 for the purpose of duplicating and mailing a report of a survey on curriculum and curricular changes. Seconded. Passed.
16. Sundquist was assigned as the Board member to serve as liason with the Student Section of AAEA. It was reported that the Student Section voted an amendment to require a membership in the Student Section to participate in its activities. Day moved that the amendment be approved. Seconded. Passed.
17. Martin reported on the progress of the Post War Literature Review.
18. Day moved to authorize Redman to negotiate with various publishers to obtain costs and information on alternatives of printing and merchandising, including subsidy, the two volumes resulting from the work of the Post War Literature Review Committee and to report the findings to the Executive Board. Seconded. Passed.
19. Day moved that AAEA express its appreciation to Lee Martin and his committee for their efforts and contributions to the post war literature endeavor. Seconded. Passed.
20. Manning reported on plans for the Annual Meeting to be held at the University of Alberta, Edmonton, on August 8–11. Manning was given permission to adjust registration fees to account for differences in the exchange rate.
21. Redman presented the possible need for obtaining liability insurance to protect the Executive Board members while on AAEA business. Day moved that Redman explore this further and obtain cost estimates on comprehensive liability coverage and consult with Tefertiller. If found desirable, Redman is to obtain coverage. Seconded. Passed.
22. Castle appointed an *ad hoc* committee to work out the technical problem of duplication of printing and distributing the *Journals* containing the papers given at the joint meeting of American, Canadian, and Western Agricultural Economics Associations.
23. Day reported on the financial and other problems of publishing the *American Bibliography of Agricultural Economics*. McKee moved that Day and his committee conduct an evaluation of the experience with publishing the *ABAE* and report to the Executive Board next August with recommendations as to the future of *ABAE*. Seconded. Passed.
24. McKee moved that we keep the cost of using our mailing addresses at the same rate and assist other nonprofit associations by inserting forms, etc., in our mailings at cost. Seconded. Passed.
25. McKee moved that Redman use his own discretion in developing procedures to send *Journals* and other materials to foreign members and libraries at added cost to the recipient. Seconded. Passed.

Adjourned at 3:30 p.m.

Respectfully submitted,
JOHN C. REDMAN
Secretary-Treasurer

MINUTES OF THE EXECUTIVE BOARD MEETING

Edmonton, Alberta, August 7-11, 1973

The meeting was called to order by President Emery Castle at 9:05 a.m., August 7, 1973.

Present:
Voting members: Castle, Day, Sundquist, McKee, Wallace, Farrell, Tefertiller
Members ex officio: Redman, Polopolus, Frick, McConnen
Guests: Robinson, Manning, Nielson

1. Manning reported on local arrangements, indicating that everything was in order.
2. Wallace moved that the Minutes of the Winter Meeting of the Executive Board at Toronto be approved. Seconded. Passed.
3. Castle read the Tellers Report indicating that James Nielson was elected as President-Elect,

Howard F. Robinson and Glenn E. Heitz as Directors.

4. Redman distributed the Secretary-Treasurer's Report and the Investment Committee Report which will be presented at the General Business Session of the AAEA.
5. Tefertiller moved that the Secretary-Treasurer be permitted to invest any surplus cash in short term obligations of the federal government or federally insured organizations. Seconded. Passed.
6. Castle read the report of the Auditing Committee. Day moved that the report be accepted. Seconded. Passed.
   Two suggestions were made by the Committee. One was for the Editor to make a report on the utilization of the funds allocated for editorial support and second was to obtain the services of a qualified outside auditor to audit the books of the AAEA at the end of 1973 and every three to five years thereafter. This would add to the completeness of the AAEA records and provide greater assurance that the accounts are in order. Day moved that an accounting of the editorial support be made by the Editor. Seconded. Passed. Day moved that an outside audit be made as recommended by the Auditing Committee. Seconded. McKee, noting that costs per year are not likely to be significantly greater to have an annual audit, moved to amend the motion that the accounts of the AAEA be audited by an outside firm annually. Seconded. Passed. Original motion as amended passed.
7. Redman reported that he had printed and shipped approximately 65,000 copies of the AAEA brochure entitled "Economists in Agriculture, Business, Government and Rural Affairs."
8. Redman reported for the Handbook-Directory Committee, indicating that the cutoff date was November 1, 1971, and a camera-ready copy was submitted to the printers on July 5, 1972. The issue appeared in February 1973. Suggestions for improvement of the next issue are encouraged.
9. Redman reported that Xerox University Microfilms paid a royalty of $469.69 for sale of microfilm editions of the *Journal.*
10. Redman reported on a proposal from Johnson Associates to publish the *Journal* in Microfiche. Action was delayed pending further evaluation of the proposal.
11. Sundquist reported for an *ad hoc* committee on selection of Fellows of the AAEA, indicating that the present procedures have led to outstanding choices as Fellows. Some suggestions were made to assure good choices.
12. Castle presented the results from a questionnaire concerning priorities, which was mailed in April 1973 to all members eligible to vote. The *Journal* emerged as the one AAEA activity having the highest priority in the minds of a strong majority of the respondents.
13. Wallace presented a report on sites for the annual meetings. Redman reported as a result of a letter written to a number of universities that three universities had offered to host the annual meeting and several universities had indicated a strong interest, but time did not permit clearing the invitation with their administrators before the Board meeting. After considerable discussion, Day moved that AAEA hold the 1977 meeting on a university campus. Seconded. Motion lost. Tefertiller moved that the Executive Board unanimously support the decision to hold the 1977 annual meeting in a commercial facility as an experiment. Seconded. Passed unanimously.
14. Wallace moved that San Diego be designated as the site for the 1977 annual meeting. Seconded. Passed.
15. Day reported for the *American Bibliography of Agricultural Economics* Committee, indicating the nature and interpretation of results of a survey. Day submitted two proposals: (1) continue with separate subscription as presently done and (2) combine with membership dues and send to all members and subscribers of *AJAE*. Day moved that *AJAE* should be sent to all members and subscribers as a part of the regular dues. Seconded. Vote was delayed until the budget was considered. It was generally agreed that the Editor of *AJAE* should require all authors to prepare a key word description of all articles submitted.
16. Wallace reported for the Professional Activities Committee.
17. Polopolus reported as Editor of *AJAE,* indicating some problems in processing manuscripts through the printer to the final issue. Also, Polopolus reported on the plans for publication of papers presented at the Educational Workshop. Because of a change in his duties at the University of Florida, Polopolus recommended that Max Langham be named Co-Editor and that Robert Emerson and Lester Myers be named Associate Editors. Wallace moved that these recommendations on Editorship be approved. Seconded. Passed.
18. After a discussion on copyrighting the *Journal,* Wallace moved that Harl, the Editor, and the Secretary-Treasurer initiate plans to copyright and that the final plans be ratified at the Winter 1973 meeting. Seconded. Passed.
19. Polopolus and Redman presented a report on cost of printing the *AJAE.* The present printer had sought a 20 percent increase which was later reduced to 14.8. This prompted the Editor and the Secretary-Treasurer to explore intensively the alternatives. A detailed comparison of costs was made with two other printers which were visited by the Editor and the Secretary-Treasurer. It was obvious that both alternatives could print the *AJAE* without any loss in quality at

a significantly lower cost than the firm which had printed the *Journal* for forty-seven (47) years. McKee moved that AAEA seek another printer effective with the December issue. Seconded. Passed. Day moved that AAEA enter into a printing contract with Heffernan Press, Inc., Worcester, Massachusetts. Seconded. Passed.

20. Frick reported for the Northeast Agricultural Economics Council, indicating that a journal is being published. Dues for the Association are $5.00 per year for regular members and $3.00 for junior members.
21. McConnen reported for the Western Agricultural Economics Association.
22. Polopolus suggested that the page charge issue be dropped since the AAEA will save some money by shifting the printing to Heffernan Press.

Meeting recessed at 5:15 p.m. and reconvened on August 8 at 8:25 a.m.

Present:

Voting members: Castle, Day, McKee, Wallace, Farrell, Sundquist, Tefertiller

Members ex officio: Redman, Polopolus, Langham, McConnen, Brown, Frick

Guests: Robinson, Nielson, Harston, Manderschied, Bonnen, Weisblatt, Trelogan, Schertz, Ackerman, Hildreth, Mather, Stanton, Martin, Smith, Epp, Plaxico

23. Brown reported for an *ad hoc* committee on publication of the Proceedings Issue which relate to three Associations meeting jointly and sharing in the publication. Report was accepted.
24. Brown reported for the Canadian Society indicating that about 650 members and 400 subscribers receive their *Journal.*
25. Castle raised the question of a joint WAEA and AAEA meeting in 1977 at San Diego. No action was taken.
26. Harston reported on the arrangements for the 1974 annual meeting at Texas A & M University.
27. Redman reported for the Institutional Membership Committee.
28. McKee reported for the Industry Committee.
29. Bonnen reported on the activities of the Statistics Committee. A request was presented for approval of membership in the Federal Statistical Users' Conference. The decision to join was deferred until the budget is considered.
30. Schertz reported for International Committee, suggesting that AAEA sponsor a review of training and research activities in the field of economics of agriculture of developing countries. Weisblatt reported on progress of RTN of the Agricultural Development Council in an effort to identify critical problems and discover those who are working on these problems; to disseminate the results of workshops, articles, reprints, etc. which do not fit into the *Journal;* and to isolate the young personnel who are interested in these problem areas. It was suggested that the decision to sponsor a review be delayed until the Saturday session of the Board when the 1974 program will be reviewed.
31. Day moved that AAEA be one of the sponsors of the Economics Institute. Seconded. Passed.
32. Hildreth reported on the visiting professor program indicating that five (5) universities requested lectures. A question was raised whether the AAEA should continue the program.
33. Mather reported for the Employment Committee which is developing a year-round employment model and registry for professional agricultural economists under a grant made to the AAEA by the Department of Labor.
34. Day presented the financial needs of the *ABAE.* Wallace moved that AAEA continue to produce the *ABAE* as presently done and ask Day to explore further the possibilities of incorporating the activity as a part of the dues, of discriminate printing, etc. Motion died for lack of second.
35. Day moved that AAEA support the publication to be sent to all members which will cost the AAEA about $11,000 annually. Seconded. Motion failed. This in effect makes the decision to continue the present arrangements for another year. Castle suggested that a committee be appointed to explore all alternatives pertaining to *ABAE* and report to the Board at the Winter Meeting (1973).
36. Redman presented the 1974 budget for consideration by the Executive Board.
37. Sundquist moved that AAEA fund a membership in the Federal Statistics Users' Conference and that the proposed budget be adjusted accordingly. Sundquist moved also that the membership include other expenses to make it effective. Seconded. Passed.
38. Farrell moved that the budget be approved as adjusted. Seconded. Passed.
39. Stanton reported for the Awards Committee.
40. Martin reported on progress of the Literature Review. Redman reported on the cost of printing and publication procedures submitted by the University Press of Kentucky. The proposal involved a joint effort by the AAEA and Press to publish the papers and if a sufficient number of copies are sold the breakeven point would be reached. Below the breakeven point would involve a small subsidy. Day moved to express general support and to proceed along the general lines as outlined.
41. Smith reported for the special committee for evaluation of *AJAE.* Sundquist moved to authorize travel expenses for members of this committee who are unable to obtain travel expenses from other sources. Seconded. Passed.
42. Redman reported for Lee on membership.

43. Plaxico reported on a Special Committee on Student Affairs Evaluation. Since copies of the report had not arrived via mail, it was agreed that the report be discussed at the next session of the Board.

Meeting recessed at 5:30 p.m. and reconvened on August 9 at 12:25 p.m.

Present:

Voting members: Castle, Day, McKee, Wallace, Tefertiller, Sundquist, Farrell
Members ex officio: Redman, Polopolus, Langham
Guests: Plaxico, Manderscheid, Epp, Sjo, Robinson, Nielson

44. After a discussion of the report on student affairs, Wallace moved that AAEA establish a Resident Instruction Committee as a standing committee to replace both the Student Activities Committee and the Education Committee (recommendation of the report). Seconded. Passed. It was noted that Constitution requires membership action to establish or abolish standing committees.
45. Day moved that recommendation 2 of the report be approved, i.e., the AAEA provide improved channels of communications among members relative to problems and potentials in resident instruction. Seconded. Passed.
46. Wallace moved that recommendation 3 of the report be approved, i.e., the student activities of AAEA (debates, essays, public speaking) continue through the 1974 meetings but that these activities not be continued after 1974 unless the Resident Instruction Committee determines that there is an expressed need and well-defined role of such activities in the future. Seconded. Passed.
47. Wallace moved that recommendation 4 be approved which will assign the Resident Instruction Committee the duties of the student affairs committee as currently outlined in the By-Laws of the AAEA and that the By-Laws be amended where appropriate to conform with this change. Seconded. Passed.
48. McKee moved that recommendation 5, which stated that if the AAEA Awards programs are to be continued, the teaching awards be continued and consideration be given to establishing an award for development of teaching materials, be referred to the Awards Committee. Seconded. Passed.
49. Day moved that By-Laws be amended as needed to implement those recommendations approved from the report of the Special Committee on Student Affairs. Seconded. Passed.

Meeting recessed at 1:30 p.m.

The following minutes of only the voting members of the Executive Board meeting in an executive session on August 10, 1973, were made available by President Castle.

The following members were present and voting: Sundquist, McKee, Wallace, Day, Farrell, Tefertiller and Castle.

a. The Constitution of the American Agricultural Economics Association (Article VI, Sec. 2) provides that "The executive board shall appoint a secretary-treasurer and an editor for the official journal of the Association, both of whom shall serve for one year terms and may succeed themselves in office."

   As an operating procedure, the executive board may reach agreements with the candidates for these positions for appointments of three to five years with the provisions for an annual evaluation preceding reappointment and a thorough performance review at the end of the three to five year appointment if an additional three to five year term is being considered. However, nothing in the agreement between the executive board and a candidate shall be deemed to create a contractual obligation beyond that specified in the Constitution. The above operating procedure will be effective beginning August 10, 1973, and will not be applied retroactively.
b. The president will appoint a committee to review the mailing procedures of the office of the Secretary-Treasurer.

   The Executive Board voted unanimously for items (a) and (b) above.

President Castle asked that the following statement be made a part of the minutes of the Executive Board.

> This is to express my appreciation for the assistance of John Redman as Secretary-Treasurer during the past year. I have found Dr. Redman to be exceedingly hard-working and quite willing to accept my philosophy that the Board is the primary policy-making body for the Association and that the function of the office of the Secretary-Treasurer is to assist in executing that policy.
>
> In addition, I have been much impressed by Redman's performance as financial manager of the funds of the Association. It is my judgement that the present healthy financial condition of this Association is due in no small measure to the efforts of John Redman. The more familiar I have become with the complexities of his office, the more impressed I have been with what he has been able to accomplish for the Association.

Meeting reconvened on August 11 at 1:10 p.m.

Present:

Voting members: Tefertiller, Day, Farrell, Heitz, Robinson, Castle
Member ex officio: Redman, Polopolus, Brown

50. Tefertiller as new President appointed Farrell as chairman of a committee and Day as a member to explore the alternatives which may be avail-

able for publication of the *American Bibliography* and to report at the Winter Meeting.

51. Tefertiller described the program already planned for the Winter Meetings.
52. Tefertiller reviewed in broad outline from the sessions being planned for the 1974 Summer Meeting at College Station, Texas, on August 18–21.
53. Heitz moved that if in transfer of the inventory of the *Journals* from Menasha to Worcester there should be any costs involving travel, the President is authorized such expenditure. Seconded. Passed.
54. Farrell moved that James Bonnen be designated as representative of AAEA in joining the Federal Statistics Users' Conference. Seconded. Passed.
55. Castle moved that the International Committee be encouraged to develop a proposal for funding a review of research and training in the international field. Seconded. Passed.
56. Tefertiller asked for suggestions for the next Editor of the *AJAE.*

Meeting adjourned at 4:10 p.m.

Respectfully submitted,
JOHN C. REDMAN
Secretary-Treasurer

MINUTES OF THE ANNUAL BUSINESS MEETING

Edmonton, Alberta, August 10, 1973

The 62nd Annual Meeting was called to order by President Castle at 1:15 p.m.

1. President Castle presented for approval the minutes of the Annual Business Meeting held in Gainesville, Florida, August 23, 1972, as published in the proceedings issue of the *AJAE.* Motion made. Seconded. Passed.
2. Redman presented the Secretary-Treasurer's Report for the fiscal year, January 1 through December 31, 1972.
3. Redman presented the Investment Committee Report for the fiscal year, January 1 through December 31, 1972.
4. Redman distributed copies of the 1974 budget which had been approved by the Executive Board.
5. Castle acknowledged the untimely death of Dr. C. D. Kearl, a longtime Secretary-Treasurer of AAEA.
6. Castle announced the results of the election. James Nielson was elected President-Elect, Howard F. Robinson and Glenn E. Heitz were elected Directors.
7. Castle read the report for the Audit Committee for the fiscal year, January 1 through December 31, 1972.
8. Polopolus reported as Editor of the *AJAE.*
9. Castle summarized the activities and actions of the Executive Board. These include: (1) made an effort to consolidate the activities of the Association by circulating a questionnaire to obtain an expression from members—the *Journal* received extremely wide acceptance and other activities were in a cluster; (2) named Polopolus and Langham as Co-Editors with Emerson and Myers as Associate Editors; (3) started to explore the steps and procedures to copyright the *Journal;* (4) changed printers for the *Journal,* from George Banta Company after 47 years to Heffernan Press; (5) authorized the funding of a membership in the Federal Statistics Users' Conference; (6) approved some changes in the Awards Program; (7) chose San Diego as the 1977 meeting site; (8) accepted several recommendations of a special committee on student affairs.
10. Trelogan moved that the AAEA copyright the *Journal* when and if the Executive Board feels it is in the interest of the Association. Seconded. Passed.
11. Redman presented two changes in the By-Laws which according to the Constitution (Article XI, Sec. 1) required action by the general membership. Redman moved that the standing committee on "Sustaining Membership" be changed to "Institutional Membership." Seconded. Passed. Redman also moved that the standing committee on "Student Affairs" be changed to "Resident Instruction." Seconded. Passed.
12. Nielson presented a Resolution thanking the University of Alberta and the Province of Alberta for hosting the meeting with copies of the Resolution to be sent to appropriate personnel. Seconded. Passed.
13. With no further business, President Castle made a few remarks in appreciation for the honor and privilege of serving the Association. He then turned the meeting over to Kenneth R. Tefertiller who became President of the AAEA. President Tefertiller on behalf of AAEA expressed gratitude to Castle for his service to the Association, invited suggestions for the 1974 program, and announced the nominating committee for officers for next year.

The meeting was adjourned at 2:30 p.m.

Respectfully submitted,
JOHN C. REDMAN,
Secretary-Treasurer

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION MINUTES AND REPORT

MINUTES OF THE MEETING OF THE WAEA COUNCIL

Edmonton, Alberta, August 9, 1973

President R. J. McConnen called the meeting to order at 4:10 p.m.

The following Council representatives were present:

R. J. McConnen	President
R. S. Firch	Vice-President
D. Gardner	Past President
R. Anderson	Hawaii
D. Fisher	Oregon
D. Hansen	California
A. Araji	Idaho
J. Garrett	Nevada
T. Dobbs	Wyoming
G. Cramer	Montana
G. Dawson	New Mexico
R. Angus	Arizona
F. Walter	Colorado
J. Anderson	Utah
D. West	Washington
O. W. Holmes	Secretary

Visitors: R. Schermerhorn

1. The Secretary-Treasurer's report was approved and accepted as presented.
2. President McConnen presented a proposal to enlarge the geographic area of the WAEA to include the four (4) Western Canadian provinces—British Columbia, Alberta, Saskatchewan, and Manitoba—and the Plain States—North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas. After detailed discussion the following motion was made, seconded, and carried. Motion: that President McConnen present this issue to the members at the annual business meeting to be held August 10, 1973, at 7:00 a.m. He will distribute copies of the changes which would be necessary in the Constitution. No action by the members will be called for. The intent of this action is to inform the members of this proposal and to alert them to possible action to be taken next year. Moved. Seconded. Carried.
3. It was moved, seconded, and carried to hold the 1974 annual meeting at Moscow, Idaho, on July 24, 25, and 26. R. Schermerhorn, Department Chairman at Moscow, will present this matter to the membership. The 1975 annual meeting will be held at Reno, Nevada. Motion: that the 1976 annual meeting of the WAEA be held at Colorado State University, Fort Collins. Moved. Seconded. Carried.
4. Motion: that the WAEA purchase no copies of the proceedings of the 1973 annual meeting. Moved. Seconded. Carried.
5. Motion: that R. J. McConnen appoint a committee to study the financial structure of WAEA, in particular the annual dues and the possibility of a page charge for articles in the proceedings, and report to next year's Council meeting. Moved. Seconded. Carried.
6. Motion to adjourn at 6:10 p.m.

ANNUAL BUSINESS MEETING OF THE WAEA

Edmonton, Alberta, August 10, 1973

Dr. McConnen, President, opened the meeting at 7:00 a.m. in the dining room of Lister Hall, University of Alberta.

1. The agenda was briefly discussed.
2. The Secretary-Treasurer's report was accepted as presented. It appears at the end of these minutes.
3. Dr. McConnen announced the following places and dates for future meetings of the WAEA.

   1974—Moscow, Idaho
   1975—Reno, Nevada
   1976—Fort Collins, Colorado

4. Dr. Schermerhorn, Department Chairman at the University of Idaho, Moscow, reported on their preparations for the 1974 meeting. They plan to hold the meeting July 24–25, 1974.
5. Dr. McConnen reported on the action of the Council concerning proposed geographic boundaries changes. Major reasons for enlarging the boundaries are: (a) broaden and increase the membership and (b) increase opportunities for new ideas and participation for agricultural economists residing in these areas.
6. Resolution Committee—Memorial Resolution: Resolve that the Western Agricultural Economics Association pay its respects and tribute to former members George Blanch and Arnold Larson who passed away during the past year.
7. Resolution Committee—General Resolutions:
   a. Resolve that the adoption of this resolution be an expression of our appreciation to Travis Manning, General Chairman of the local arrangements committee, and to other members of the Department of Agricultural Economics and Rural Sociology of the University of Alberta for their excellent preparation for this meeting and for their gracious hospitality offered during our stay on this beautiful campus.
   b. Resolve that adoption of this report further conveys our sincere thanks to Dick McConnen, President of WAEA; Emery Castle, President of AAEA; Jacob Brown, President of CAES; and to other members of the Executive Committee of these Associations for planning and offering a stimulating and

timely program, for judicious choice of speakers, and for their effective leadership in conducting the affairs of these Associations during the past year.

c. Resolve that an appointed member of the Department of Agricultural Economics and Rural Sociology of the University of Alberta relay our appreciation to University officials and officials of the city of Edmonton for the excellent facilities we have enjoyed here at this 46th annual meeting.

d. Resolve that a common form be adopted by all Agricultural Economics Associations in the United States for dues collection for membership and that all Associations have a reciprocal agreement for collection of these dues.

7. In-coming President Halter is to appoint a committee to study the possibility of instituting a page charge for articles submitted to the proceedings and the current dues structure.
8. Awards Chairman G. Cramer reported briefly on the WAEA awards program. He stressed the need for more clear cut instruction and guidelines so that the individual chairmen will be better able to perform their tasks.
9. Tellers report: Del Gardner reported on the election of president and vice-president. The President-Elect is Walt Butcher; Vice-President is Herb Stoevener.
10. Installation of officers: Dr. McConnen passed the presidency on to the new officers.

Herb Stoevener, Vice-President, adjourned the meeting at 8:15 a.m.

O. WENDELL HOLMES
Secretary Treasurer

WAEA SECRETARY-TREASURER'S REPORT

Financial Statement for Calendar Year 1972

Cash on hand, January 1, 1972			$1761.65
Receipts:			
Membership dues	$2637.19		
Proceedings sales	342.00		
Logan, Utah, surplus	377.00		
Other: Contributing members	140.00		
Transfer from savings	700.00		
Total receipts		=	4196.19
Total			$5957.84
Expenditures:			
Dues transmitted—AAEA	35.00		
1972 Awards Program	310.00		
1971 Proceedings	3356.44		
Postage	165.50		
Miscellaneous	66.10		
Total expenditures		=	3933.04
Cash on hand (Checking account), December 31, 1972			2024.80
Savings account balance, January 1, 1972			4095.21
Transferred to checking account			−700.00
Interest received			+168.50
Savings account balance, December 31, 1972			$3563.71

Membership

Calendar year totals: *1968*, 786; *1969*, 715; *1970*, 702; *1971*, 578; *1972*, 471.

Table 1. 1972 membership by states and type of member

States	Junior Member	Regular Member	Total Members
13 Western States			
Alaska	—	3	3
Arizona	2	23	25
California	11	74	85
Colorado	2	17	19
Hawaii	—	9	9
Idaho	1	12	13
Montana	1	20	21
Nevada	2	7	9
New Mexico	2	14	16
Oregon	16	20	36
Utah	4	13	17
Washington	4	36	40
Wyoming	2	15	17
TOTAL	47	263	310
6 Plains States			
Kansas	—	7	7
Nebraska	1	13	14
North Dakota	—	7	7
Oklahoma	1	8	9
South Dakota	—	8	8
Texas	—	15	15
TOTAL	2	58	60
D.C., Maryland, and Virginia	—	43	43
Other states	5	34	39
Canada	—	11	11
Other countries	—	8	8
TOTAL	5	96	101
GRAND TOTAL	54	417	471

O. WENDELL HOLMES,
Secretary-Treasurer

PAST EDITORS OF THE AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS

Editors	*Institution*	*Volumes*	*Years*
L. A. Moorhouse	Office of Farm Management, USDA	1–3	1919–1921
O. C. Stine	Bureau of Agricultural Economics, USDA	4–6	1922–1924
E. G. Nourse	Institute of Economics, Brookings Institution	7–8	1925–1926
H. R. Tolley	Bureau of Agricultural Economics, USDA	9–11	1927–1929
H. E. Erdman	University of California, Berkeley	12–14	1930–1932
O. B. Jesness	University of Minnesota	15–17	1933–1935
H. C. M. Case	University of Illinois	18–19	1936–1937
T. W. Schultz	Iowa State University	20–23	1938–1941
H. B. Price	University of Kentucky	24–25	1942–1943
Warren C. Waite	University of Minnesota	26–30	1944–1948
Walter W. Wilcox	Library of Congress	31–33	1949–1951
Lawrence W. Witt	Michigan State University	34–36	1952–1954
Harold G. Halcrow	University of Connecticut	37–39	1955–1957
Robert L. Clodius	University of Wisconsin	40–41	1958–1959
Herman M. Southworth	Pennsylvania State University	42–44	1960–1962
James Nielson	Michigan State University	45–47	1963–1965
Earl R. Swanson	University of Illinois	48–50	1966–1968
Varden Fuller	University of California at Berkeley (1969) at Davis (1970–1971)	51–53	1969–1971
Leo Polopolus	University of Florida	54–	1972–

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William J. Spillman	1910–1912
George F. Warren	1913
Daniel H. Otis	1914
Andrew Boss	1915
Harcourt A. Morgan	1916
Henry W. Jeffers	1917
George A. Billings	1918
John R. Fain	1919
Henry C. Taylor	1920
Walter F. Handschin	1921
Benjamin H. Hibbard	1922
Thomas P. Cooper	1923
Edwin G. Nourse	1924
Milburn L. Wilson	1925
Thomas N. Carver	1926
John I. Falconer	1927
Lewis C. Gray	1928
H. E. Erdman	1929
Harold C. M. Case	1930
Oscar C. Stine	1931
John D. Black	1932
Howard R. Tolley	1933
William I. Myers	1934
Waldo E. Grimes	1935
Joseph S. Davis	1936
Oscar B. Jesness	1937
Ernest C. Young	1938
Irving G. Davis	1939
Foster F. Elliott	1939
Hugh B. Price	1940
Murray R. Benedict	1941
George S. Wehrwein	1942
Sherman E. Johnson	1943
Eric Englund	1944
Lawrence J. Norton	1945
Frederick V. Waugh	1946
Asher Hobson	1947
William G. Murray	1948
Oris V. Wells	1949
Warren C. Waite	1950
Forest F. Hill	1951
George H. Aull	1952
Harry R. Wellman	1953
Thomas K. Cowden	1954
Joseph Ackerman	1955
Karl Brandt	1956
H. Brooks James	1957
Harry C. Trelogan	1958
Raymond G. Bressler Jr.	1959
Willard W. Cochrane	1960
William H. Nicholls	1961
Bushrod W. Allin	1962
George E. Brandow	1963
Lowell S. Hardin	1964
D. Gale Johnson	1965
Kenneth L. Bachman	1966
Lawrence W. Witt	1967
C. E. Bishop	1968
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Dale E. Hathaway	1970
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Emery N. Castle	1973

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